BULLETIN
OF THE
University of New Mexico

WHOLE NO. 89

EDUCATIONAL SERIES | DECEMBER, 1917 | VOLUME 2, NO. 1

A HIGH SCHOOL MANUAL

(SECOND EDITION)

STANDARDS AND GENERAL RECOMMENDATIONS
FOR THE
ACCREDITING OF HIGH SCHOOLS
BY THE
UNIVERSITY OF NEW MEXICO

EDITED BY
LYNN BOAL MITCHELL
DEAN OF THE UNIVERSITY AND CHAIRMAN OF THE
COMMITTEE ON ADMISSION

ALBUQUERQUE, NEW MEXICO

PUBLISHED QUARTERLY BY THE UNIVERSITY OF NEW MEXICO
ENTERED MAY 1, 1906, AT ALBUQUERQUE, N. M. AS SECOND CLASS MATTER
UNDER ACT OF CONGRESS OF JULY 16, 1894

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Preface

The writing of this bulletin has been largely the labor of compilation and editing of material submitted from various sources. The compiler and editor hereby acknowledges his indebtedness to his colleagues of the Faculties of the University and of the State College, to Mr. P. E. Leavenworth of the Albuquerque High School, to the deans and officers of a number of American universities and colleges, and to the authors of the Bulletin of the University of Illinois, Volume XII, No. 43.

LYNN B. MITCHELL.

Albuquerque, N. M.
June, 1916.

Preface to Second Edition.

The present edition represents the revision of certain sections, the introduction of some new material, and the retention of some portions as they appeared in the first edition.

LYNN B. MITCHELL.

Albuquerque, N. M.
January, 1918.

Introduction

Not so very long ago the institutions of higher learning assumed towards the high school an attitude of dictatorial tyranny. It was assumed that no high school could offer any course that would not primarily and directly meet the entrance requirements of the colleges. Lately, however, it has been realized that great harm has been done to the cause of education by this attitude. In the first place, the majority of high school graduates do not attend college and it is admitted by college authorities now that the high school curriculum should be arranged to meet primarily the needs of this majority. The great State universities of the Middle West have been the leaders in accepting for entrance a diminished amount of Latin and Greek, history, etc., and in enlarging the list of studies that may be offered for entrance. The studies prescribed for entrance to the Colleges of Letters and Science, leading to the degree of Bachelor of Arts, are now reduced to a minimum and are looked upon as being those subjects that any high school officer would regard as being the necessary foundation of any high school course.

The University of New Mexico, following the lead of other institutions, rarely now gives any entrance examinations to candidates, but examines rather the high schools from which the candidates present themselves. The basis of granting to the high schools the privilege of allowing their graduates to enter the University without examination has been visitation and inspection. While looking forward to having a special officer (High School Visitor) for this purpose in the near future, the University has been accrediting high schools by means of visitation and inspection by the President and other members of its Faculty.

The purpose of establishing the accredited relations between high schools and the University has been to aid the high schools, in a constructive way, as well as to benefit the University. The University also seeks to co-operate with school authorities to effect higher standards of high schools

in villages and small towns which are able to maintain only from one to three years of high school work.

This manual is for the use of superintendents, principals, teachers, and school boards. It gives information in regard to entrance requirements, standards required for accrediting and suggests the material equipment of high schools. The University has compiled this manual in the hope that it may prove to be mutually beneficial to both University and high school and may lead to a greater degree of co-operation to meet the ends of education.

The Accrediting of High Schools

High schools or academies are inspected for the purpose of establishing the accredited relation on application from the principal or superintendent. Upon receipt of such application blanks will be sent to the applicant for a full and complete report on the conditions existing in the high school or academy. If it appears from this report that the school is probably worthy of a place on the accredited list an inspection will follow as soon as possible.

The general conditions looked for in the preliminary report from a school are:

1. Is the length of the school year at least 36 weeks of actual school work?
2. Is the district financially able to sustain a school at such standards as to insure reasonable efficiency?
3. Are there three or more teachers devoting full time to high school work?
4. Does the preparation of the teachers represent study beyond the high school?
5. Do any of the teachers have more than six periods a day of recitation or laboratory work?
6. Are the recitation periods at least 40 minutes in length?
7. Are consecutive double periods provided for all unprepared work, such as laboratory, drawing, and shop?
8. Is the material equipment of the school adequate for the work which it undertakes?
9. Are textbooks well chosen?

The University reserves the right to accredit a school partially and to reconsider or modify the accrediting at any time in case of deterioration of work.

The University will accredit work done in one, two and three year high schools in proportion to the amount of work done in a creditable manner. Some of the standards for such schools are:

1. The length of the school year should be 36 weeks of actual school work.
2. Recitation periods should be 40 minutes in length,

with double consecutive periods for laboratory, shop, or drawing.

3. The material equipment must be adequate for the courses offered.

4. The teachers should have at least two years of training bepond the course of a standard four year high school.

5. For a three year school the full teaching time of at least two teachers should be required.

6. For a two year school the full teaching time of one teacher and at least one-half of the full time of another teacher should be required.

7. Where the ninth grade only is offered, at least one-half of the full time of one teacher should be given to this grade.

Each student coming to the University from a wholly or partially accredited high school should write to the Registrar of the University for the proper blank on which the principal is requested to make a transcript of the candidate's record. Until such a transcript is presented or entrance examinations are passed, no person can become a student in good standing at the University. The applicant for admission will find a blank certificate in each catalog after 1917.

The High School Curriculum

Frequently the University receives a request that it suggest a model "course of study" for a given high school. This is extremely difficult to do without full information on all the facilities and conditions existing at this school. And there is the danger that such a "model course" may tend to become a fixed type and impede readjustments sources of weakness in curricula may, however, be pointed out. The practice so common among smaller high schools of radically changing the course of studies from year to year is to be deplored. This is one of the causes of irregularity and inefficiency in this type of schools, and school authorities would do well to avoid such frequent and often unnecessary changes.

Another source of weakness is found in the effort to make the course of studies include too much for the teaching force of the school. In order to extend the curriculum recourse is frequently had to some plan of alternation by which two high school grades are thrown together on the same subject. This is a practice which can safely be indulged in only to a limited extent in high school work. As previously stated the University requires the full time of three teachers as a minimum for accrediting a four year high school. In a straight four year program, with four subjects a year for each pupil, there will not be room for many more than sixteen courses where the teaching force consists of only three persons without placing upon their shoulders too heavy a load of teaching.

In some of the high schools which have a fair-sized teaching force it is to be regretted that the pupils are permitted to carry too heavy a schedule. Nothing is gained by the pupil who succeeds in earning 18 or 19 units in the space of four years. Such a pupil must necessarily sacrifice quality of work for quantity. And it has been observed that the graduates of a high school in this State who present for entrance to the University on the average over 17 units of work do not make as satisfactory a record in the Univer-

sity on the average as the graduates of another high school who rarely present more than the required 15 units for admission. These two high schools are of about the same size and there is no choice to be made between them on the basis of physical plant, equipment and teaching force.

Care should be exercised in planning a program of studies that over-emphasis should not be given to any one group of studies to the neglect of others. For example, a program of studies that would contain four years of history and no science at all cannot be considered a well balanced one.

School authorities, in introducing new courses, such as commercial or manual training, home economics, or agriculture, should consider carefully their ability to provide adequate equipment for laboratory or shop and for a reference library as well as the difficulty of providing competent teachers. Courses which are in the experimental stage, such as general science, should be left to the stronger schools which can afford the experiment until some definite standards have been agreed upon as to what the aim and content of the course should be and its proper place in the four years' program.

The High School Curriculum in Its Relation to College Entrance

(Revised from an address given by Professor L. B. Mitchell, Chairman of the Committee on Admission to the University, before the High School and College Section of the New Mexico Educational Association, November, 1915.)

The history of the American college curriculum begins with the Latin, Greek, Mathematics, and Moral Philosophy of the Harvard college course of 1636 and so long as there was a quasi-aristocracy of higher education for those who entered the three great professions of theology, law, and medicine, the curriculum was essentially confined to these subjects. And for a long time the curriculum of the high school was confined to these same subjects—the so-called "humanities." But a new era has lately begun and we now see people going to college for a preparation for every walk of life. There is a strong demand for the obviously practical studies, until we have the twentieth century agricultural college offering its valuable array of courses in weeds, horse-shoeing, spraying of trees, rations of hogs, fancy cooking for man and beast, and business correspondence. The dominant tendency in the development of American colleges and high schools is towards the so-called practical. Some, thinking it an easy matter to distinguish between the practical and the unpractical, have included in the former all professional and technical branches and have assigned to Limbo the old humanities as being unpractical and wholly ornamental. There is no such thing as a purely practical subject and no such thing as a purely cultural subject. Any subject may be partially cultural—dressmaking, for example, and sign-painting, and blacksmithing. Under certain conditions, for certain persons, such studies would be chiefly cultural. Any study, on the other hand, may be practical, as Latin is for one who teaches it or needs it as a basis for medicine or law. Perhaps we can say that all subjects are either immediately practical or ultimately practical. The cry for the practical subjects has extended

from the colleges to the high schools, and there is a tendency in some quarters to emphasize the immediately practical and to sacrifice the ultimately practical. One should constantly be on his guard not to give up the goal of educating the student and to avoid substituting for this a mere apprenticeship to some trade.

State universities are generally requiring 15 units for entrance, a unit being a subject pursued through at least 36 weeks with four or five recitations a week or the equivalent in laboratory or practice work.

Of the 15 units required for entrance to the College of Arts, Philosophy, and Science (the B. A. course), 9 are prescribed and the remainder are elective. The prescribed units are:

English, 3 units.
History, 1 unit.
Foreign language, 2 units in one language.
Algebra, 1 unit.
Plane Geometry, 1 unit.
Laboratory science, 1 unit.

What right have the universities and colleges to require that the high schools shall include these subjects in the work completed by each graduate who goes to college? In the first place, in answer to this question so naturally raised, we ask what subjects can be substituted in their stead that would have a more ultimately practical value for every student. Shall we cut down the amount of English required for graduation from the high school? In view of the deplorably weak command of the native language of the majority of our citizens, we should be unwilling to graduate students with less Eiglish. The ability to express one's ideas clearly, vigorously, and concisely is so important that no sacrifice can be tolerated here. In fact, the colleges require their students to take one or two more years in English, at least one of them in composition and rhetoric.

Time is not available to offer any defence for the inclusion of the other subjects of the prescribed list, except to state that two years are not more than are needed to give a working knowledge of any foreign language. The foreign language and the mathematics have a well-earned place in the prescribed list because they are the two subjects par excellence of value in developing the power to think ac-

curately. The foreign language gives a better insight into the understanding of one's native language. The algebra and geometry are indispensable as a foundation for all technical courses. Nobody, I believe, would be in favor of abolishing the requirement of one year's work in history. The requirement is meagre enough as it stands now. As for the laboratory science, it is essential that this great and important branch of knowledge be included so that the student may be taught the rudiments of the scientific method of investigation and the ability to draw the logical and inevitable conclusions from a given set of phenomena, whether he ever uses the subject matter he has learned in the course or not.

We can hardly neglect any of the branches of knowledge contained in the prescribed list. Taken together, they represent the different phases of information and they are all either immediately or ultimately practical.

While we were listening yast year to an able man from the University of Illinois, Dr. Lotus E. Coffman, another professor in the same department, Dr. Bagley, was lecturing before the Illinois Conference of High School Teachers. In speaking about the prescribed list, he justified a certain measure of uniformity in courses through the grades and the high schools by the following arguments:

"First," he says, "there is the mere economy or expediency of administering a single curriculum, as compared with administering differentiated curricula. Secondly, the justification of a certain measure of uniformity furnishes one rather definite standard for selecting common elements. Thirdly, this uniformity can be insured without interfering unduly with desirable differentiation. Fourthly, common elements in the curriculum are not only justified but they are demanded by social needs and particularly by the needs of a democracy. If democracy depends upon any one factor, it depends upon social solidarity; it depends upon a certain community of ideas, standards, and aspirations among all members of the democratic society. Democracy involves the collective consideration of common problems. There must be a basis for common discussion. The leaders must be able to make their appeal to the people in terms that will be understood, and if this appeal is to rise above

the level of instinct or primitive interest or class prejudice there must be among the people a common knowledge.

"This general principle may, I think, be embodied in two statements, the first of which, at least, is so axiomatic as to claim the title of a law. It may be formulated as follows:

"The efficiency of a democracy is directly dependent upon the number of ideas that are common to all the members of the democratic group.

"The second is:

"The level upon which a democratic society does its collective thinking is dependent upon the level to which formal education has raised the great majority of its members, or, to put it in another way, a high plane of common ideas is essential to collective thinking on a high plane."

Dr. Bagley's whole address is illuminating and helpful but time moves on and enough has been said, I think, to justify the requirement of the universities that the high school course shall furnish a certain degree of uniformity in those subjects which afford the basis of general information and the foundation of the professions and arts.

It is always necessary to bear in mind that 80% of the high school graduates do not go to college and the high school curriculum should primarily be designed to meet the needs of its pupils. While a student will not get very far along in some subjects, such as economics, chemistry, and trigonometry, and will have to repeat them in most cases in college, still, if he does not go to college a little knowledge of these things is better than no knowledge at all. Those students who expect to attend college should be advised to avoid in their high school course such subjects as trigonometry, chemistry, economics, education, and psychology.

An observation on the personnel of the teaching force emerges at this point. It is highly desirable to have in the high school teaching corps some college trained persons who are competent to give intelligent advice to their pupils as to what courses are best for them to elect, whether they expect to continue their studies in college or not.

There has been a demand in some quarters that agriculture and home economics be accepted by the University as meeting the requirement of one unit in a laboratory sci-

ence for entrance. It is not believed by the University of New Mexico, as well as by all other state universities, with the possible exception of Illinois and Ohio, that these subjects as now taught deserve to be regarded as on a par with the laboratory sciences enumerated in group 5A under list A. However, if at any time a course is brought to the notice of the University Faculty in which the laboratory method is pursued and the real scientific character of the course is demonstrated, the University is willing to accept such work as a laboratory science. As usually taught, courses in sewing, in which cloth is cut and garments made, and courses in cooking, in which students follow recipes handed them by their instructors, are not the equivalent of such laboratory courses as biology or physics. A course in agriculture, too, where the so-called laboratory part of the course consists of bugging a row of potatoes or hoeing a and home economics should not have a place in the high row of corn, can hardly be recognized as a laboratory science. A laboratory science is much more than simply spending two or more consecutive recitation periods in some practice work. Scientific agriculture, especially real work in soils, presupposes a knowledge of chemistry, at least, if not other sciences, and whether such a course as one in soils can be effectively given in high schools is to be doubted and if it is given without a previous knowledge of some other science it will sink to the level of a textbook and recitation course and cannot be regarded as a laboratory science. A science taught from a textbook and without laboratory periods for observation of phenomena and the careful recording of conclusions is not a laboratory science.

We do not intend to give the impression that agriculture school program of studies. But both of these subjects are yet in the experimental stage and are not standardized as are courses in physics, chemistry, or biology. Dr. Humbert, Dean of Agriculture at the State College, thinks that at present no course can be outlined for the high schools of this State. Conditions here are different from those obtaining in other States. We should wait a while, he thinks, until it is seen from further experience just what courses are feasible in this State. It is probable that in a few years it will be seen just what courses are practicable. The work to

be undertaken will probably lie in the fields of soils, crops, animal husbandry, irrigation, and dry farming.

In home economics it is possible to arrange a course in foods that can be accepted as a laboratory course. Such a course would involve a careful study of the principles underlying the preparation, the digestion, and assimilation of food, the changes produced in food by heat and cold, and the taking of notes on the observation of the operation of laws and the drawing of conclusions from the phenomena observed. If this is done, such a course may rise to the rank of the other laboratory sciences. But sewing, although a portion of the course is called, but falsely called, laboratory work, it not a science at all, but an industrial art, and may be offered towards entrance to the University only as an elective.

Music has lately been placed in the list of subjects that may receive credit towards entrance to the University. While the ancient Greeks and Romans followed a three-fold curriculum, in which the physical, intellectual, and aesthetic elements in man's nature were developed, the Middle Ages seem to have placed a taboo on the physical and aesthetic and aimed solely to develop the intellectual powers. Fortunately, in these later days the importance of physical wellbeing is again being appreciated and we are well along on the road towards recognizing that in order to have a *mens sana* we must have a *sanum corpus* as its receptacle. But the aesthetic side of man's nature is still deplorably neglected, being represented in high school only by music, drawing, and such study of design as enters into household decoration, and sewing, while the colleges have but lately given recognition to the educational value of music. Since the B. A. course is regarded as being primarily cultural and imparting the *ars bene vivendi*, courses in music, drawing, fine arts, and others having distinct aesthetic values should be accepted to considerable degree for the B. A. degree. The University has for some time allowed credit for drawing and now, wishing to give some recognition to music, has voted to accept towards entrance a maximum of two units in music, that is to say, a maximum of one unit in theory and history of music and a maximum of one unit in voice or instrument. Inasmuch as no standards have yet been set for high school courses in voice and or-

chestral instruments, it will be necessary for the candidate who offers training in voice or some instrument towards entrance to pass an examination in order to obtain credit. He will be required to render with proper expression and technique a piece of such grade or difficulty as has been established by the Department and to perform at sight another piece of less difficulty. The requirements are fully explained in the catalog of the University.

The Equipment of Laboratories

Primarily this problem should be considered in the plans for building a high school as it frequently happens that architects, having little knowledge of such matters, if left alone, will place the laboratories where they will best fit into their own plans, instead of considering the requirements for light, space, etc. When plans are being prepared, the following considerations may well be kept in mind:

1. Proper lighting. Rooms in which microscopes are to be used should have an abundance of north light. North light, or better yet, overhead light, should be provided for rooms used for drawing and art work. On the other hand, the quarters for biology should have direct sunlight in those rooms where life forms are to be preserved.

2. Suitable cases for taking care of apparatus should be built in.

3. Good substantial tables for experimental work will be needed and the physics laboratory should have a solid table of masonry or concrete.

4. Good ventilation should be aimed at in all cases and in the chemistry laboratory hoods to carry gases and fumes into the outer air are a prime necessity.

5. If possible some room should be provided for the use of a stereopticon. It is often possible to prepare one lecture room so that it can serve the needs of a lecture and demonstration room for the sciences. This room should have a lecturer's desk provided with a sink, gas, and water. Dark curtains at the windows can be provided so that the room can quickly be darkened for the use of the lantern. The greatest use can not be derived from a lantern unless it is possible to darken a room in a few moments for a few pictures, whenever desired, and again to have light as soon as the pictures are finished.

6. A convenient water supply with sufficient lavatories and sinks.

7. A gas plant is needed for chemistry and is almost indispensable for home economics.

School authorities should bear in mind, when they contemplate the addition of a new laboratory course, that adequate equipment should be provided as well as competent instruction. Where limited means are at hand it is far better to provide first class equipment both in quantity and quality for one science than to divide the available funds between two laboratories and thus be unable to do justice to either. There are many articles of equipment that find use in more than one course so that when once complete equipment is on hand for one course it will be found that it is possible to purchase equipment for a second course for considerable less expense.

Suggestive lists of equipment for different subjects are to be found in connection with the description of courses. It is often suggested where such equipment may be obtained. The following sources of supply are, therefore, supplementary:

Biology.

A. A. Sphung, North Judson, Ind. Live or preserved frogs, crawfish, turtles, etc.

H. M. Stephens, Dickinson College, Carlisle, Pa. Zoological and botanical materials for class use.

C. S. Brimley, Raleigh, N. C. Reptiles, amphibians, and fishes, living or preserved.

Biological Supply Co., 106 Edgerton St., Rochester, N. Y. Plant and animal materials for laboratory slides.

Marine Biological Laboratory, Woods Hole, Mass. Preserved materials for botany, zoology and embryology.

St. Louis Biological Laboratory, St. Louis, Mo. Microscopic and lantern slides.

Apparatus and Supplies.

*C. H. Stoelting Co., 121 N. Green St., Chicago.

*Central Scientific Co., 412 Orleans St., Chicago.

*A. H. Thomas Co., Philadelphia.

*Denver Fire Clay Co., Denver.

*Braun Corporation, Los Angeles.

Chicago Apparatus Co., 40-42 W. Quincy St., Chicago.

*Wm. Gaertner Co., 5347-9 Lake St., Chicago.

*Henry Heil & Co., 212-214 S. Fourth St., St. Louis, Mo.

*Eimer & Amend, 205-211 Third Ave., New York.

L. E. Knott Apparatus Co., Harcourt St., Boston (laboratory furniture).

*E. H. Sargent & Co., 143-145 Lake St., Chicago.

*Bausch & Lomb Optical Co., Rochester, N. Y., and San Francisco.

McIntosh Stereopticon Co., 35-37 Randolph St., Chicago.

Kewanee Mfg. Co., Kewanee, Wis. (laboratory furniture).

Leonard Peterson & Co., 1240 Fullerton Ave., Chicago (laboratory furniture).

*The starred firms furnish chemicals as well as equipment.

Shop Work and Mechanical Drawing Supplies.

Simmons Hardware Co., St. Louis Mo.

Orr & Lockett Hardware Co., 71-73 Randolph St., Chicago.

Hammacher, Schlemmer & Co., 4th Ave. and 13th St., New York City.

E. Dietzgen & Co., Chicago.

Weber & Co., St. Louis, Mo.

A. S. Aloe Co., St. Louis, Mo.

The local hardware dealer can furnish much of the equipment needed for shop work and generally supplies for drawing can be obtained through the local bookstore.

The High School Reference Library

In the larger schools it will be well to have a library room with suitable book-stacks, tables, etc. In the smaller schools a corner, or side, or rear of the study room may be utilized for library purposes. This plan works very well even in moderately large schools.

For the work of the high school two classes of reference are needed: First are the general reference works, such as dictionaries, encyclopedias, atlases, and statistical compendiums. Then come the special reference works for the different departments of high school work, selected in order to give opportunity for rather extensive collateral reading on important and controverted topics of the textbooks. Each department of the high school should be represented in this collection. These books should be kept together in the library or study room rather than in the recitation or laboratory rooms of the several departments as there are frequently cross references from one department to the literature of another.

Scattered along through this Manual there are suggestive lists of reference books following the description of courses under the several departments. These lists are of varying length. Apparently some of our Faculty have furnished what they thought to be an irreducible minimum of reference books and others have furnished a larger list. It was intended that the lists be made up in such a way that the books would be suggested in the order of their importance but this scheme could not in all cases be followed out. It is urged that the importance of a reference library be kept in mind. Collateral reading is of prime importance and it is hoped that when a sentiment exists in favor of introducing additional courses it will be kept in mind that adequate provision for reference books and physical equipment are problems to be solved by school authorities as well as the problem of securing competent instruction.

REFERENCE BOOKS ON EDUCATION AND PEDAGOGY FOR TEACHERS.

Johnson and Others: The Modern High School (Scribner's) 1914.
Parker: Methods of Teaching in High Schools (Ginn) 1915.

Brown: The American High School (Macmillan) 1909.
Judd: Psychology of High School Subjects (Ginn) 1915.
Graves: A Student's History of Education (Macmillan) 1915.
Klapper: Principles of Educational Practice (Appleton) 1912.
James: Talks on Psychology and Life's Ideals (Holt).
Hibben: The Problems of Philosophy (Scribner's).
Dewey: How We Think (Heath).
Davis: Vocational and Moral Guidance (Ginn) 1914.
Lee: Play in Education (Macmillan) 1915.

Admission to the University

GENERAL STATEMENT.

An applicant for admission to any of the colleges or schools of the University must be at least sixteen years of age.

Women are admitted to all departments under the same conditions as and on absolute equality with men.

The University year is divided into four quarters of about twelve weeks each and students may enter the University at the beginning of any quarter. Entrance at other times is not denied them, but it is seldom that students can enter late and be able to achieve satisfactory results. Students can seldom enter the College of Engineering to advantage except at the beginning of the Autumn quarter.

Students may be admitted at any time during the University year, but should enter, if possible, at the beginning of a quarter.

Students who register after the time appointed for this purpose must pay the late registration fee and the amount of credit given in each course for which they register will be diminished in proportion to the lateness of their entrance.

ENTRANCE REQUIREMENTS.

The requirements for admission are stated in terms of units. The term "unit" means the completion of a course of study consisting of five recitation periods of at least forty minutes each per week during at least thirty-six weeks. A laboratory period or other practice work should extend over at least two consecutive recitation periods and is considered the equivalent of one recitation.

Fifteen units are required for admission to any College or School of the University (except the Graduate School), some of which are prescribed and the remainder elective. The variation existing between the prescribed subjects and those that may be offered as electives is shown in the following exhibit, in which list A in every case is prescribed, and the remainder of the fifteen units required for entrance may be elected from lists B and C in the amounts indicated.

FOR ADMISSION TO THE COLLEGES OF ARTS, PHILOSOPHY, AND SCIENCE, FINE ARTS, AND COURSES IN EDUCATION AND HOME ECONOMICS.

LIST A.

English, 3 units.
History, Government, and Economics, 1 unit.
Foreign Language (in one language), 2 units.
Algebra, 1 unit.
Plane Geometry, 1 unit.
Laboratory Science, 1 unit.
Total prescribed, 9 units.
From List B (see below), 2-6 units.
From List C (see below), ½-4 units.
Total, to make 15 units.

(Note.—Students who expect to take the Course in Education should include U. S. History and Civics, History and Civics of New Mexico, and Physiology, where possible.)

FOR ADMISSION TO THE COLLEGE OF ENGINEERING.

LIST A.

English, 3 units.
Foreign Language (in one language, preferably modern), 2 units.
Algebra, 1½ units.
Geometry, Plane and Solid, 1½ units.
Physics, 1 unit.
Total prescribed, 9 units.
From List B, 2-6 units.
From List C, ½-4 units.
Total to make 15 units.

The matriculant must offer the subjects contained in List A for admission to the College or School of which he expects to become a member. Under List C are given the minimum and maximum number of units that are accepted from that list by each College or School. The remainder of the fifteen units required for entrance is to be offered from List B. None of the subjects in List C is prescribed for entrance and if no electives are offered from this list, the number of units needed in addition to List A to make a total of fifteen is to be taken from List B.

ENTRANCE WITH CONDITIONS.

Applicants for admission to the University who can fur-

nish thirteen units are admitted to Freshman standing with entrance conditions in the prescribed or elective units in which they are deficient. This deficiency must be removed in the first year of residence.

LIST B.

Four units is the maximum amount accepted from any group in this list, including the units already offered to meet the requirements in List A, except the group of foreign languages, where six units may be accepted, including the two units required in this group in List A.

1. Group of English Language, Composition and Literature.

2. Group of Foreign Languages.
French, 1-4 units.
German, 1-4 units.
Greek, 1-3 units.
Latin, 1-4 units.
Spanish, 1-4 units.
Other foreign languages, 1-4 units each.

3. Group of History and Social Science.
Ancient History, ½-1 unit.
Medieval and Modern History, ½-1 unit.
English History, ½-1 unit.
American History, ½-1 unit.
Civics, ½ unit.
History and Civics of New Mexico, ½ unit.
Economics, ½ unit.

4. Group of Mathematics.
Algebra to Quadratics, 1 unit.
Algebra, complete, 1½ units.
Plane Geometry, 1 unit.
Solid Geometry, ½ unit.
Algebraic Theory, advanced, ½ unit.
Trigonometry, ½ unit.
Advanced Arithmetic, ½ unit.

5A. Group of Laboratory Sciences.
Botany, ½-1 unit.
Zoology, ½-1 unit.
Chemistry, 1 unit.
Physics, 1 unit.
Physiology, ½ unit.

Physiology-Biology, 1 unit.
Physical Geography, ½-1 unit.
Geology, ½-1 unit.

5B. Group of Non-Laboratory Sciences.

Any of the above, if given without adequate laboratory equipment and practice, and also the following:
General Science, ½-1 unit.
Astronomy, ½ unit.
Psychology, ½ unit.

LIST C.

The maximum amount that may be offered from this list for entrance to the various Colleges and Schools of the University is indicated above, but nowhere exceeds four units. The maximum that will be accepted in any one subject contained in the group is shown below:

Agriculture, ½-2 units.
Home Economics (Domestic Science and Domestic Art), ½-3 units.
Commercial Subjects, ½-4 units.
Manual Training and Arts, ½-2 units.
Music, ½-2 units.

(Note.—Ordinarily Agriculture and Home Economics are not accepted as meeting the requirement of one unit in a laboratory science. It is believed, however, that certain courses in these subjects with proper equipment and adequate instruction can be regarded on a par with the sciences in Group 5A in List B. Any applicant offering Agriculture or Domestic Science (Foods and Cooking) as a laboratory science should present notebook and such other evidence as is likely to demonstrate that the course pursued should be regarded as efficient as, say, Physics or Biology or Chemistry, in developing accuracy and method in scientific investigation.)

OPTIONAL SUBJECTS.

An optional subject is any subject taken in the high school not included in List B or List C. A maximum of one unit in optional subjects may be accepted, subject to the nature and quality of the work done, but not with four units from List C.

Description of Subjects Which May Be Accredited and Accepted for Admission

The Faculty of the University are of the opinion that the four years of the high school and the four years of the college should so fit into each other and complete each other that at the time of graduation from college the student will have received a broad foundation in several branches of study and considerable special and intensive training in the department in which he shows the greatest capability. To this end the Faculty have arranged the various subjects into groups according to the relationship which exists between the several subjects. By the time graduation time is reached, taking into consideration the high school course as well as the college course, the student will have become acquainted with some of the subjects in each of the several groups. When a student has neglected any one of the more important groups, he is compelled to take more work in that group in his college course. And *vice versa* when he has taken a large amount of work in any of the more important groups in his high school course, his graduation requirements in that group are diminished. This principle applies particularly to the groups of foreign language, and the natural sciences. High school and college subjects are accordingly arranged into groups as follows:

English.
Foreign Languages.
History, Government, and Economics.
Mathematics.
Natural Sciences.
Vocational and Industrial Subjects.

The University catalog under Requirements for Graduation from the College of Arts, Philosophy, and Science should be consulted for detailed information as to the requirements in foreign language and sciences. In order to profit by the exemptions allowed in foreign languages, it should be noted that more than four units should be offered. It also often happens that a student can include two laboratory sciences or additional mathematics in his high

school course and by so doing obtain exemption from a part of the requirement in science after he reaches the University.

DESCRIPTION OF COURSES.

In this section an attempt is made to furnish a description of all courses that may find place in the high school curriculum, to set up the goal to be reached in each course, to give a list of textbooks suitable for each course and the equipment needed for the successful teaching of each course wherever the course involves necessary laboratory or practice work.

I.

GROUP OF ENGLISH LANGUAGE, COMPOSITION, AND LITERATURE.

(Furnished by Professor Proctor F. Sherwin.)

Three units prescribed, one additional elective.

It is recommended that three years of the high school course in English conform to the following standard. This amount of work, if of satisfactory quality, will be accepted as fulfilling the prescribed requirement of three units in English.

UNIFORM COLLEGE ENTRANCE REQUIREMENTS IN ENGLISH.

The study of English in school has two main objects: (1) command of correct and clear English, spoken and written; (2) ability to read with accuracy, intelligence, and appreciation.

GRAMMAR AND COMPOSITION.

The first object requires instruction in grammar and composition. English grammar should be reviewed in the secondary school; and correct spelling and grammatical accuracy should be rigorously exacted in connection with all written work during the four years. The principles of words, sentences, and paragraphs should be thoroughly mastered; and practice in composition, oral as well as written, should extend throughout the secondary school period. Written exercises may well comprise letter-writing, narration, description, and easy exposition and argument. It is advisable that subjects for this work be taken from the student's personal experience, general knowledge,

and studies other than English, as well as from his reading in literature. Finally, special instruction in language and composition should be accompanied by concerted effort of teachers in all branches to cultivate in the student the habit of using good English in his recitations and various exercises, whether oral or written.

LITERATURE.

The second object is sought by means of two lists of books, headed respectively *Reading* and *Study,* from which may be framed a progressive course in literature covering three or four years. In connection with both lists, the student should be trained in reading aloud and be encouraged to commit to memory some of the more notable passages both in verse and prose. As an aid to literary appreciation, he is further advised to acquaint himself with the most important facts in the lives of the authors whose works he reads and with their place in literary history.

A. READING.

The aim of this course is to foster in the student the habit of intelligent reading and to develop a taste for good literature, by giving him a first-hand knowledge of some of its best specimens. He should read the books carefully, but his attention should not be so fixed upon details that he fails to appreciate the main purpose and charm of what he reads.

With a view to large freedom of choice, the books provided for reading are arranged in the following groups, from each of which at least two selections are to be made, except as otherwise provided under Group I.

Group I—Classics in Translation.

The Old Testament, comprising at least the chief narrative episodes in Genesis, Exodus, Joshua, Judges, Samuel, Kings, and Daniel, together with the books Ruth and Esther.

The Odyssey, with the omission, if desired, of Books I, II, III, IV, V, XV, XVI, XVII.

The Iliad, with the omission, if desired, of Books XI, XIII, XIV, XV, XVII, XXI.

The Aeneid.

The Odyssey, Iliad and Aeneid should be read in English translations of recognized literary excellence.

For any selection from this group a selection from any other group may be substituted.

Group II—Shakespeare.

Midsummer Night's Dream,	Richard II,	
Merchant of Venice,	Richard III,	
As You Like It,	Henry V,	
Twelfth Night,	Coriolanus,	
The Tempest,	Julius Caesar,	If not chosen
Romeo and Juliet,	Macbeth,	for study
King John,	Hamlet,	under B.

Group III—Prose Fiction.

Malory: Morte d'Arthur (about 100 pages).
Bunyan: Pilgrim's Progress, Part I.
Swift: Gulliver's Travels (voyages to Lilliput and to Brobdinag).
Defoe: Robinson Crusoe, Part I.
Goldsmith: Vicar of Wakefield.
Frances Burney: Evelina.
Scott's Novels: any one.
Jane Austen's Novels: any one.
Maria Edgeworth: Castle Rackrent, or The Absentee.
Dickens' Novels: any one.
Thackeray's Novels: any one.
George Eliot's Novels: any one.
Mrs. Gaskell: Cranford.
Kingsley: Westward Ho! or Hereward, the Wake.
Reade: The Cloister and the Hearth.
Blackmore: Lorna Doone.
Hughes: Tom Brown's School Days.
Stevenson: Treasure Island, or Kidnapped, or Master of Ballantrae.
Cooper's Novels: any one.
Poe: Selected Tales.
Hawthorne: The House of the Seven Gables, or Twice Told Tales, or Mosses From an Old Manse.
A collection of Short Stories by various standard writers.

Group IV—Essays, Biography, Etc.

Addison and Steele: The Sir Roger de Coverley Papers, or Selections from the Tatler and Spectator (about 200 pages).
Boswell: Selections from the Life of Johnson (about 200 pages).
Franklin: Autobiography.
Irving: Selections from the Sketch Book (about 200 pages), or Life of Goldsmith.
Southey: Life of Nelson.
Lamb: Selections from the Essays of Elia (about 100 pages).
Lockhart: Selections from the Life of Scott (about 200 pages).
Thackeray: Lectures on Swift, Addison, and Steele in the English Humorists.
Macaulay: Any one of the following essays: Lord Clive, Warren Hastings, Milton, Addison, Goldsmith, Frederick the Great, Madam d'Arblay.
Trevelyan: Selections from the Life of Macaulay (about 200 pages).
Ruskin: Sesame and Lilies, or Selections (about 150 pages).

Dana: Two Years Before the Mast.

Lincoln: Speeches, including at least the two Inaugurals, the Speeches in Independence Hall and at Gettysburg, the Last Public Address, the Letter to Horace Greeley; together with a brief memoir or estimate of Lincoln.

Parkman: The Oregon Trail.

Thoreau: Walden.

Lowell: Selected Essays (about 150 pages).

Holmes: The Autocrat of the Breakfast Table.

Stevenson: An Inland Village and Travels With a Donkey.

Huxley: Autobiography, and selections from Lay Sermons, including the addresses on Improving Natural Knowledge, A Liberal Education, and A Piece of Chalk.

A collection of Essays by Bacon, Lamb, De Quincey, Hazlitt, Emerson, and later writers.

A collection of Letters by various standard writers.

Group V—Poetry.

Palgrave: Golden Treasury (First Series): Books II and III, with special attention to Dryden, Collins, Gray, Cowper, and Burns.

Palgrave: Golden Treasury (First Series) Book IV, with special attention to Wordsworth, Keats, and Shelley (if not chosen for study under B).

Goldsmith: The Traveller, and The Deserted Village.

Pope: The Rape of the Lock.

A collection of English and Scottish Ballads, as, for example, some Robin Hood ballads, the Battle of Otterburn, King Estmere, Young Beichan, Bewick and Graham, Sir Patrick Spens, and a selection from later ballads.

Coleridge: The Ancient Mariner, Christabel, and Kubla Kahn.

Byron: Childe Harold, Canto III or IV, and The prisoner of Chillon.

Scott: The Lady of the Lake, or Marmion.

Macaulay: The Lays of Ancient Rome, The Battle of Naseby, The Armada, Ivry.

Tennyson: The Princess, or Gareth and Lynette, Lancelot and Elaine, and The Passing of Arthur.

Browning: Cavalier Tunes, The Lost Leader, How They Brought the Good News From Ghent to Aix, Home Thoughts From Abroad, Home Thoughts From the Sea, Incident of the French Camp, Hervé Riel, Pheidippides, My Last Duchess, Up at a Villa—Down in the City, The Italian in England, The Patriot, The Pied Piper, "De Gustibus—", Instans Tyrannus.

Arnold: Sohrab and Rustum, and the Forsaken Merman.

Selections from American Poetry, with special attention to Poe, Lowell, Longfellow and Whittier.

B. STUDY.

This part of the requirement is intended as a natural and logical continuation of the student's earlier reading, with greater stress laid upon form and style, the exact meaning of words and phrases, and the understanding of allusions. The books provided for study are arranged in

four groups, from each of which one selection is to be made.

Group I—Drama.

Shakespeare: Julius Caesar, Macbeth, Hamlet.

Group II—Poetry.

Milton: L'Allegro, Il Penseroso, and either Comus or Lycidas.

Tennyson: The Coming of Arthur, The Holy Grail, and The Passing of Arthur.

The selections of Wordsworth, Keats, and Shelley in Book IV of Palgrave's Golden Treasury (First Series).

Group III—Oratory.

Burke: Speech on Conciliation With America.

Macaulay: Two Speeches on Copyright; and Lincoln: Speech at Cooper Union.

Washington: Farewell Address; and Webster: First Bunker Hill Oration.

Group IV.—Essays.

Carlyle: Essay on Burns, with a selection from Burns' Poems.

Macaulay: Life of Johnson.

Emerson: Essay on Manners.

EXAMINATIONS.

However accurate in subject-matter, no paper should be considered satisfactory if seriously defective in punctuation, spelling, or other essentials of good usage.

In grammar and composition, the student should be asked specific questions upon the practical essentials of these studies, such as the relation of the various parts of a sentence to one another, the construction of individual words in a sentence of reasonable difficulty, and those good usages of modern English which one should know in distinction from current errors. The main test on composition should consist of one or more essays, developing a theme through several paragraphs; the subjects should be drawn from the books read, from the student's other studies, and from his personal knowledge and experience quite apart from reading. For this purpose the examiner should provide several subjects, perhaps eight or ten, from which the student may make his own selections. He should not be expected to write more than four hundred words per hour.

The examination in literature should include:

A. General questions designed to test such a knowledge and appreciation of literature as may be gained by fulfilling the requirements defined under A. READING, above.

B. A test on the books prescribed for study, which should consist of questions upon their content, form, and structure, and upon the meaning of such words, phrases, and allusions as may be necessary to an understanding of the works and an appreciation of their salient qualities of style. General questions may also be asked concerning the lives of authors, their other works, and the periods of literary history to which they belong.

It is recommended that the Grammar and Composition represent one-half and the Literature the other half of these three years' work. The Grammar and Composition should predominate in the first year and receive attention on three days a week. In the second year, the available time should be distributed equally between Composition and Literature, and in the third year, the Literature should occupy three days a week.

The work outlined above is suggested for a three years' course in English in high schools. It will be accepted by the University as meeting the prescribed entrance requirement of three units in English.

An additional full year's study, which should consist of one period of Composition and four periods given to the study of either American or English literature taught as a systematic historical survey with textbook and supplementary readings, may be offered as a fourth unit in English.

REFERENCE LIBRARY IN ENGLISH.

A. English Language.

Dictionaries.—New English Dictionary on Historical Principles (Oxford University Press); New Standard Dictionary (Funk and Wagnalls); Skeat: Concise Etymological Dictionary of the English Language (Am. Bk. Co.); Webster's New International Dictionary (G. & C. Merriam & Co.)

Grammar.—Blount and Northup: English Grammar for Schools (Holt); Kittredge and Farley: Advanced English Grammar (Ginn); Scott and Buck: Brief English Grammar (Scott, Foresman).

Reference.—Emerson: History of the English Language, $1.25 (Macmillan); Fernald: Connectives of English Speech, $1.50 (Funk & Wagnalls); Fernald: English Synonyms and Antonyms, $1.50 (Funk & Wagnalls); Greenough and Kittredge: Words and Their Ways in English Speech, $1.10 (Macmillan); Krapp: Modern English, Its Growth and Present Use (Scribner's); Peile: Philology, $0.40 (Am. Bk. Co.); Weekley: The Romance of Names, $1.25 (Dutton); Weekley: The Romance of Words, $1.25 (Dutton).

B. Rhetoric.

Oral and Written Composition.—Baldwin: College Manual of Rhetoric, $1.60 (Longmans); Baldwin: Composition, Oral and Written, $1.25 (Long-

mans); Baldwin: How to Write, $0.50 (Macmillan); Baldwin: Writing and Speaking (Longmans); Briggs and McKinney: First Book of Composition for High Schools, $0.90 (Ginn); Buehler: Practical Exercises in English, $0.50 (Am. Bk. Co.); Greenough and Hersey: English Composition (Macmillan); Hitchcock: New Practice Book in English Composition, $1.10 (Holt); Leonard and Fuess: High School Spelling Book (Am. Bk. Co.); Linn: Essentials of English Composition, $1.00 (Scribner's); Lomer and Ashmun: Study and Practice of Writing English, $1.10 (Houghton); Manly and Powell: Manual for Writers, $1.00 (University of Chicago Press); Shurter:Extempore Speaking, $0.90 (Ginn); Slater: Freshman Rhetoric, $1.00 (Heath); Winans: Public Speaking, Principles, and Practice, $1.50 (Century).

Forms of Composition.—Scott and Zeitlin: College Readings in English Prose, $1.25 (Macmillan); Jelliffe: Handbook of Exposition, $0.90 (Macmillan); Knapp and French: Speech for Special Occasions, $1.10 (Macmillan); Baker: Forms of Public Address, $1.00 (Holt); Baker and Huntington: Principles of Argumentation, $1.50 (Ginn); Gardiner: The Making of Arguments, $1.00 (Ginn); Esenwein and Chambers: Art of Story-Writing, $1.25 (Home Correspondence School); Albright: Descriptive Writing (Macmillan); Albright: The Short Story, Its Principles and Structure, $0.90 (Macmillan); Hyde: Newspaper Reporting and Correspondence, $1.50 (Appleton); Smart: How to Write Business Letters, $1.00 (Shaw).

Theory.—Cooper: Theories of Style, $1.10 (Macmillan); Smith: Mechanism of English Style, $1.00 (Oxford University Press); Welldon: Rhetoric of Aristotle (Macmillan); Wendell: English Composition, $1.50 (Scribner's).

C. English and American Literature.

Anthologies.—Manly: English Poetry, $1.50 (Ginn); Manly: English Prose, $1.50 (Ginn); Ward: English Poets, 5 volumes, $5.00 (Macmillan); Craik: English Prose, 5 volumes, $5.50 (Macmillan); Calhoun and MacAlarney: Readings From American Literature, $1.40 (Ginn); Page: Chief American Poets, $1.75 (Houghton); Weston: Chief Middle English Poets, $2.00 (Houghton); Neilson and Webster: Chief British Poets of the XIVth and XVth Centuries, $2.50 (Houghton); Lynn: Collection of XVIIIth Century Prose, $1.10 (Macmillan); Alden: Readings in English Prose of the XVIIIth Century, $2.25 (Houghton); Page: British Poets of the XIXth Century, $2.00 (Sanborn); Stedman: American Anthology, $3.00 (Houghton); Stedman: Victorian Anthology, $2.50 (Houghton).

History.—Pancoast: Introduction to English Literature, $1.35 (Holt); Pancoast: Introduction to American Literature, $1.12 (Holt); Long: English Literature, $1.35 (Ginn); Long: American Literature, $1.35 (Ginn); Bronson: American Literature (Heath); Wendell and Greenough: His-

tory of Literature in America (Scribner's); Greenlaw: Syllabus of English Literature, $1.35 (Sanborn); Ryland: Chronological Outlines of English Literature, $1.50 (Macmillan); Whitcomb: Chronological Outlines of American Literature, $1.50 (Macmillan); Cairns: History of American Literature, $1.25 (Oxford University Press); Baldwin: Introduction to English Medieval Literature, $1.25 (Longmans); Gosse: History of XVIIIth Century Literature, $1.50 (Macmillan); Herford: Age of Wordsworth, $1.00 (Macmillan); Stedman: Victorian Poets, $2.25 (Houghton); Stedman: Poets of America, $2.25 (Houghton); Pattee: History of American Literature since 1870, $2.00 (Century).

Types.—Courthope: History of English Poetry, 6 volumes, $18.00 (Macmillan); Minto: Manual of English Prose Literature, $1.50 (Ginn); Gummere: Oldest English Epic, $1.10 (Macmillan); Sargent and Kittredge: English and Scottish Popular Ballads, $3.00 (Houghton); Mead: Selections from Malory's Morte d'Arthur, $0.80 (Ginn); Sommer: Malory's Morte d'Arthur (Text), $2.00 (Nutt, London); Schelling: English Drama, $1.50 (Dutton); Tatlock and Martin: Representative English Plays (Century); Manly: Specimens of Pre-Shakespearean Drama, 2 volumes, $2.50 (Ginn); Neilson: Chief Elizabethan Dramatists, $2.75 (Houghton); Fulton and Trueblood: British and American Eloquence, $1.25 (Ginn); Harding: Select Orations (American), $1.25 (Macmillan); Bryan and Crane: English Familiar Essay (Ginn); Canby: Study of the Short-Story, $1.00 (Holt); Cross: Development of the English Novel, $1.50 (Macmillan); Hopkins and Hughes: English Novel Before the XIXth Century, $1.60 (Ginn).

Bible.—Moulton: Modern Reader's Bible, $2.00 (Macmillan); Moulton: Short Introduction to the Literature of the Bible, $1.00 (Heath).

Individual Authors.—In general, the following are recommended, in the order given, as the best standard editions of the poets: Oxford Editions of Standard Authors, $0.50 each (Oxford University Press); The Cambridge Poets, $1.50 and $2.25 each (Houghton, Mifflin Co.); New Globe Poets, $1.75 each (Macmillan).

Kittredge: Chaucer and His Poetry, $1.25 (Harvard University Press); Dowden: Shakespeare, $0.35 (Am. Bk. Co.); Corson: Introduction to Milton; Sneath: Wordsworth—Poet of Nature and Poet of Man, $2.00 (Ginn); Van Dyke: Poetry of Tennyson, $2.00 (Scribner's); Corson: Introduction to Browning, $1.00 (Heath).

D. Introductory, Pedagogical, Bibliographical Reference.

Ballou: Scales for the Measurement of English Composition, $0.50 (Harvard University Press); Bartlett: Familiar Quotations (Little); Bradish: Old Norse Stories, $0.45 (Am. Bk. Co.); Brown: How the French Boy Learns to Write, $1.25 (Harvard University Press); Chubb: Teaching of English, $1.00 (Macmillan); Cooper: Aristotle on the Art of Poetry, $0.80 (Ginn); Cooper: Methods and Aims in the Study of Literature, $1.20 (Ginn); Corson: Aims of Literary Study, $0.75 (Macmillan); Corson: Primer of English Verse, $1.00 (Ginn); Gayley: Classic Myths in English Literature and in Art, $1.50 (Ginn); Guerber: Myths of Greece and Rome, $1.50 (Am. Bk. Co.); Winchester: Five Short Courses of Reading, $0.50 (Ginn); Winchester: Some Principles of Literary Criticism, $1.50 (Macmillan).

E. Parliamentary Law.

Gaines: New Cushing's Manual of Parliamentary Law and Practice, $0.75 (Dutton); Robert: Rules of Order, Revised, $1.00 (Scott, Foresman); Three Charts for Parliamentary Law, $5.00 (U. S. Printing and Litho. Co., Erie, Pa.).

F. Periodicals for Teachers.

The Dial, $3.00 (Chicago); English Journal, $2.50 (University of Chicago Press); Quarterly Journal of Public Speaking, $2.00 (Banta).

II.

GROUP OF FOREIGN LANGUAGES.

Two units of foreign language in one language are required for entrance to all colleges and schools of the University, and in the case of the College of Engineering the offering should be modern language. Six units is the maximum amount that is accepted in foreign languages and when an applicant offers six units as entrance to the College of Arts, Philosophy, and Science, the amount of foreign language required for graduation from this College is reduced. Foreign students, who do not intend to pursue the study of English in the University, may offer their native language and literature in lieu of the entrance requirement in English, if equivalent in quality and amount, and in case this is done, they are required to offer English as their foreign language. Foreign languages not listed below may be offered as meeting the requirement in foreign language for entrance, but indvidual cases are judged on their own merits.

FOREIGN LANGUAGES AFTER THE WAR.

(Extracts from an article by Dean Mitchell in University News.)

The situation in American public schools in regard to the status of foreign languages is a very interesting one. German has been ruled out by many local school boards and by State boards. French is being substituted for German and Spanish is growing in favor.

There is, however, but little change of feeling towards Latin, except that it is apparently increasing in favor in America as well as in Europe. It has been the favorite foreign language in the past, and while no longer required in the curriculum in many places, it will continue in popularity.

Taking the country as a whole, German in the past has easily held second place in high school and college for several reasons.

(1) Americans of German origin cling to the language of their fathers longer than do the descendants of other origin. German continues to be spoken for several generations while the children of Russian or Italian immigrants are proud to learn the language of the country of their adoption. German communities in the United States have been influential enough to compel school authorities to place German in the curriculum. For reasons of sentiment, this cause of the prevalence of German in certain communities will be removed to a considerable extent. Loyal German-speaking Americans after the war will show a greater inclination to abandon their native language and customs in their desire to become more thorough Americans.

(2) A generation ago, German universities were leading the way in various educational lines and large numbers of our college graduates, desiring to study further, resorted to German universities. After obtaining a doctor's degree they returned to America and filled chairs in our colleges. The majority of professors in our most influential universities were German trained and naturally created the impression that most of what was worth knowing was written in German by German scholars. Many American scholars have made themselves ridiculous by publishing their investigations in German rather than in English, seeking for a reputation abroad rather than at home. These professors have had a great deal to do in extending the study of German in high schools and colleges.

This reason for the popularity of German no longer operates. It is now agreed that certain American universities offer better advantages than any in Germany, that the American Ph. D. is worth more than the German brand of the same article, and that, if a graduate student wants to study abroad, there are possibilities in England, France, and Italy which have not in the past been appreciated or even understood. A large per cent of the knowledge written in German—practically all that is worth while—has been translated into English. The German language in the future will not be the repository for knowledge which it has been in the past. Lastly, German professors, showing

themselves ready to defend at the behest of their emperor any violation of international law, have forfeited their influence in this country.

French is rapidly supplanting German in favor and for several reasons.

(1) The reason of sentiment. France is becoming more endeared to America by more complete realization of the obligation to France incurred in the Revolutionary war.

(2) Increased interest in French on the part of war workers. Returning soldiers will increase interest in France and her language.

(3) After the war France and the United States will have at least an irrefragable bond of friendship for each other due to co-operation in the war—a guarantee of peace and harmonious relations stronger than any mere political alliance can afford.

(4) France and the French language will open up a field of culture, civilization, humanity, the arts, sciences, and literature, to which American students will turn after the war. It is not likely that as many students will go to France for study as have gone to Germany, for our own universities are now very good, but those who do go and return to take up teaching and other professions will be in a position to direct the thoughts of many other people toward France.

(5) The system of exchange professorships as it has been practiced between the United States and Germany will be discontinued and we shall witness future exchange of professors and students with other members of the allied group, particulary England, France, and Italy.

(6) Scholars who desire to publish in another language besides English will in the future use French or Latin.

(7) French for a long time has been the most widely used language for diplomacy and travel, and English for commerce. These two languages after the war will become more securely entrenched in their positions and will be the two most widely used languages.

(8) Lastly, but by no means of least importance. French is more easily learned than many other languages.

The study of Spanish is increasing by leaps and bounds in this country as its citizens realize its importance. Americans should remember that a large part of the territory of

the United States is, or at least has been Spanish-speaking. We can enumerate here the southwest, the Philippines, Porto Rico, etc. Other countries employing this language, especially South America, offer great opportunities in trade. The demand for Spanish really is based not so much upon cultural possibilities as upon the opportunities which lie in turning it to practical account in trade with our neighbors.

Enormous opportunities for business will be opened up in Russia, China, and other countries, but the public schools cannot offer all the languages called for by business men. Each section of the country can best offer in its schools the languages which are of broadest value to that section. Latin will continue to be taught all over the country as possessing universal cultural and educational advantages. Some schools will have the facilities to offer more than one modern language but the majority of them, on account of not having unlimited funds, will offer only one modern language. In New Mexico, for example, where much emphasis is laid upon Spanish, it would be a mistake to insist that it be taught if a capable teacher is not available. In the southwest Spanish will deservedly be offered as the first modern language, and in other sections it will be offered as the third modern language. French will doubtless be considered the modern language of primary importance.

It is conceivable that in the extreme northwest, Russian may become so important that it will have a place in the curriculum of high schools. The University of Washington is offering Russian and Chinese. After the war there is likely to be no little commercial activity between Russia and the State of Washington. The banks and commercial houses will form Russian connections and Russian will become of primary importance to large groups of people in the north Pacific States. The citizens of Seattle may have no more need of French or Spanish than the people of El Paso and New Orleans are likely to need Russian, while the citizens of the latter cities will have great use for Spanish.

Germany had made considerable commercial progress in the world because she took care to learn the languages of her rivals and potential enemies. We can learn a lesson in this respect from Germany. Japan is doing the same thing.

The United States has been forced to abandon her "splendid isolation" and foreign languages will be studied to greater extent after the war than ever before. In educational circles there will be demand for French, Spanish, German, Portuguese, Russian, Japanese, and Chinese. This demand for modern languages will vary at different times and in different places. It would be folly and waste for high schools to offer many of these languages as they would serve the needs of a small proportion of their patronage. For reasons of economy and efficiency, the study of most languages should be postponed until the student attends a university. The university student, besides, knowing better what he wants and being more mature, can make more rapid progress. It is not likely that any high school in New Mexico for many years to come, can offer more than two languages if it takes into consideration its facilities and income. The two languages in this State should be Latin and Spanish. New Mexico should not become excited over French to the extent of allowing it to be substituted for or in any way to cripple the effective teaching of Spanish, nor should she become excited over modern language to the extent of eliminating Latin for the sake of offering more modern languages. For the average person, one ancient and one modern language are of more value than two modern languages. Where only one language can be offered on account of limited means, the question whether it should be Latin or Spanish is best decided by determining which of the two can be better taught by the members of the teaching corps.

1. French, 1-4 units. (Furnished by J. F. Nelson, sometime Professor of Modern Languages.)

First Year's Work.—Elementary grammar, with the more common irregular verbs. Careful training in pronunciation. About 100 pages of easy prose should be read.

Second Year's Work.—Advanced grammar, with all the irregular verbs. Elementary composition and conversation. About 300 pages of standard authors should be read.

Third Year's Work.—Intermediate composition and conversation. About 500 pages of standard authors should be read, including a few classics.

Fourth Year's Work.—Advanced composition and con-

versation. Standard modern and classical authors should be read and studied to the amount of 700 pages.

(Note.—It is not recommended that French be offered in New Mexico high schools for the present.)

TEXT AND REFERENCE BOOKS.

Grammar.—Fraser and Squair: Shorter French Course (Heath); Thieme andEffinger: A French Grammar (Macmillan).

Composition.—French Composition (Heath); Francois: French Composition (Am. Bk. Co.); Talbot: French Composition (Sanborn).

Readers.—Halevy: L'Abbe Constantin (Heath); Merimee: Colomba (Heath); La Brete: Mon Oncle et Mon Cure; Laurie: Memories d'un Collegien.

Dictionaries: Heath's French-English Dictionary; Lauson: Histoire de la Literature Francaise.

2. German, 1-4 units. (Furnished by J. F. Nelson, sometime Professor of Modern Languages.)

It is recommended that pupils be trained to understand spoken German and to reproduce freely, in writing and orally, what has been read. Whatever method of teaching is used, however, a thorough knowledge of grammar is expected. No attempt is made in what follows to give more than a general outline for the work of successive years, but the Department of German welcomes inquiries from teachers who wish further suggestions in planning their courses.

First Year's Work.—At the end of the year pupils should be able to read intelligently and with accurate pronunciation simple German prose, to translate it into idiomatic English, and to answer in German easy questions on the passages read. A few short poems may well be memorized. Elementary grammar should be mastered up to the subjunctive as arranged in most books for beginners. Easy prose composition rather than the writing of forms should be the test of this grammatical work.

Second Year's Work.—About 500 pages of modern authors should be read, preference being given to material which has a distinctly German atmosphere and which lends itself readily to conversational treatment in the classroom. The regular recitations should afford constant oral and written drill on the elementary grammar of the preceding year. More importance should be attached to accuracy and facility in simple modes of expression than to theoretical knowledge of advanced syntax.

Third Year's Work.—Most of the time should still be devoted to good modern prose. There should be some work in advanced prose composition based on German models—and the daily recitation should continue to afford abundant oral practice. Pupils ought by this time to understand spoken German fairly well.

Fourth Year's Work.—At the end of this year a pupil should be able to read at sight any prose or verse of moderate difficulty. He should be able to express himself orally or in writing with considerable readiness and a high degree of accuracy. It is recommended that work in composition take the form of free reproduction of portions of the texts studied rather than translations of English selections. The reading should be divided about equally between modern and classical authors.

SUGGESTED TEXTBOOKS.

First Year.—Vos: Essentials of German, or Bacon: German Grammar, or Spanhoofd: Lehrbuch der Deutschen Sprache, complete. Reading, translation, and discussion of about 200 pages chosen from books like Mosher: Wilkommen in Deutschland; Guerber: Maerchen und Erzaelungen; Bacon: Im Vaterland; Holzwarth: Gruss aus Deutschland; and Price: Reformlesebuch.

Second Year.—Drill in speaking, reading and writing German. Harris: German Composition; or Wesselhoeft: German Composition. For reading choice may be made from the following: Immensee, Germelhausen, Hoeher als die Kirche, Der Neffe als Onkel, and Widenbruch: Lachendes Land.

Third and Fourth Years.—Compositions continued, either as translations from English or by means of original essays on simple subjects. Books like the following have proved most popular for advanced classes in high school German: Wilhelm Tell, Minna von Barnhelm, Hermann und Dorothea, Die Jungfrau von Orleans, Maria Stuart, and Die Journalisten.

REFERENCE LIBRARY FOR HIGH SCHOOLS.

Adler: A German Dictionary (Appleton); Heath: German Dictionary (Heath); Francke: History of German Literature (Henry Holt); Coar: Studies in German Literature in the 19th Century (Macmillan); Kluge: Deutsche Nationalliteratur (Am. Bk. Co.); Keller: Bilder aus der Deutschen Literatur (Am. Bk. Co.); Bernhardt: Geschichte der Deutschen Literatur (Am. Bk. Co.); Heller: Studies in Modern German Literature (Heath & Co.).

3. Greek, 1-3 units. (Furnished by Professor L. B. Mitchell.)

First Year's Work.—The exercises in any of the beginning books such as Benner and Smyth, White, Burgess,

Gleason and Atherton, etc., and one book of the Anabasis or its equivalent.

Second Year's Work.—Two additional books of the Anabasis intensively studied and one book at sight, and three books of Homer's Iliad or their equivalents, together with grammar and prose composition equal to one exercise a week for one year.

Third Year's Work.—Three additional books of the Iliad and books VI and VII of Herodotus, or an equivalent from other authors, together with composition and grammar one day a week.

(Note.—It is recommended that Greek be not offered for the present by New Mexico high schools. The small number of candidates who present themselves for Greek does not justify the expense of instruction. Students who want Greek are advised to wait until they reach the University where they can complete the work much more rapidly.)

(Note.—See under Latin for a list of teacher's accessories, such as maps, charts, pictures, lantern slides, plaster casts, etc.)

Latin, 1-4 units. (Furnished by Professor L. B. Mitchell.)

The Latin Department recommends the course of study reported by the Commission on College Entrance Requirements in Latin, which is as follows: (a) In grammar and prose composition a knowledge of forms and syntax should be acquired sufficient for writing simple Latin prose. (b) In reading the amount shall not be less than Caesar: Gallic War, I-IV; Cicero: six orations, and Vergil: Aeneid I-VI; and should be chosen from Caesar (complete), Nepos, Cicero (Orations, Letters, and De Senectute), Sallust, Ovid, and Vergil (complete). (c) Out of the above, the following reading is required: Cicero's Manilian Law and Archias and the Aeneid I, II, and either IV or VI. (d) Sight translation shall be performed of prose and verse of such difficulty as the scope of the above would justify.

First Year.—The ordinary beginning book, such as Bennet, D'Ooge, Pearson, and the like, can advantageously be supplemented by using some reader such as Scudder's Gradatim. While it is highly important that the pupil acquire acquaintance with paradigms and the simpler principles of syntax, it is also important that he acquire the

ability to read Latin with facility. Since it is believed that the whole of the second year should not be given to Caesar, a beginner's book that does not offer an exclusively Caesarian vocabulary is preferred. Nutting's Latin Primer and Latin Reader are recommended.

Second Year.—Considerable time should be spent in reviewing grammar and at least one period a week should be given to prose composition. The Latin read should represent in amount at least Books I-IV of Caesar: Gallic War, but should be selected from the whole of the Gallic War, Viri Romae, Nepos, and the like. In Caesar, Book I, chapter 1, all of Book II, Book VI, chapters XI-XXIII should be read and further selections made from Books IV, V, particularly chapters XXVI-LVIII, and Book VII. Greenough and Daniell: Second Year Latin (Ginn) is a suitable textbook for the second year, as is also D'Ooge and Eastman: Caesar (Ginn). The latter contains within its covers sufficient reading, grammar, and composition for a year's work.

Third Year.—At least one period a week should be given to syntax and composition, some book like Bennett: New Latin Composition, Part II, being used in connection with a standard grammar. The amount read should be equal in amount to six orations of Cicero and should include the orations on the Manilian Law and for Archias. The remainder may be selected from other orations and the letters of Cicero. The Catiline of Sallust is recommended as a substitution for the Catilinarian orations. (Scudder's edition has citations from the orations against Catiline at the bottom of the page.) Inasmuch as some students drop their study of Latin at the end of the third year and ordinarily read no poetry, a good plan is to include in the third year's work some of the Metamorphoses of Ovid. Gleason: A Term of Ovid is a good text for this purpose.

Fourth Year's Work.—The amount read should be equal to Books I-VI of the Aeneid of Vergil. The first six books may be read entire or selections made from the whole work. In this case Books I, II, IV, and VI should be read and the remainder of the course given to selections from VII-XII including particularly IX, 168-469. Some Ovid or an oration of Cicero may be included in the course. The Iliad and Odyssey of Homer should be read in prose translation.

The eleventh book of the Odyssey and the Divine Comedy of Dante can profitably be used in connection with the sixth book of the Aeneid.

SOURCES OF EQUIPMENT.

1. **Wall Maps.**—Kiepert Classical Series (Rand McNally & Co.), $4.80 and up; Johnston Classical Maps (A. J. Nystrom & Co., Chicago), $2.80 and up.

2. **Charts.**—Gurlitt: Six wall plates of Caesar's Bellum Gallicum (Nystrom & Co., Chicago), $2.00 each; Cybulski: Twenty colored plates, illustrating the life of the Greeks and Romans—weapons, war machines, soldiers, houses, costumes, coins, ships, etc. (Nystrom & Co.) $2.00-$3.50 each.

3. **Pictures.**—Perry Pictures (The Perry Co., Malden, Mass.), $0.01 to $0.07 each; Brown's Pictures (Geo. P. Brown & Co., Beverly, Mass.), $0.00½ to $0.03 each; Bureau of University Travel, Boston, Mass.; Berlin Photo Co., 305 Madison Ave., New York; Elson Art Publishing Co., Belmont, Mass.; Bureau of University Travel, 136 Stuart St., Boston, Mass. (Pictures from the above houses cost from one cent to two dollars each.) Schreiber: Atlas of Classical Antiquities (Macmillan, $6.50; Art and Archaeology, bimonthly magazine (Archaeological Institute of America), The Octagon, Washington, D. C., $2.00 per year.

European Addresses for Photographs: Alinari & Cook, 137a Via Sistina, Rome; E. Pigatti, Via Sistina, Rome; Alex. Simiriottis, Athens.

4. **Post Cards.**—German-American Book Co., 625 Gratiot Ave., Detroit; F. A. Ackerman, Kunstverlag, Munich, Germany; Edv. V. Cotina, Via Chiala, Naples, Italy (Pompeian subjects).

5. **Lantern Slides.**—George R. Swain, 1230 Woodland Ave., Ann Arbor, Mich.; Records of the Past Exploration Society, Washington, D. C.; Arthur S. Cooley, Lehigh University, South Bethlehem, Pa. Slides for rent, $0.07 for two weeks, $0.10 for one month.

6. **Casts.**—P. P. Caproni & Brother, Boston. Discount for schools.

7. **Models.**—G. E. Stechert & Co., 151-155 W. 25th St., New York. Models for such articles as ballista, catapult, wagon, door, etc., $0.30 to $6.00.

8. **Entertainments.**—Miller: Two Dramatizations from Vergil (University of Chicago Press), $1.00; Code: When the Fates Decree (based on Vergil), published by author, 1318 Sheridan Road, Pittsburgh, Pa.; Paxson: Two Latin Plays (Ginn), $0.45; Wilson: The Vestal Virgins, a spectacular taper drill (Edgar S. Werner & Co.), $0.15.

HIGH SCHOOL REFERENCE LIBRARY.

General Reference.—Harper: Latin Dictionary (Am. Bk. Co.), $6.50; Smith and Hall: English-Latin Dictionary (Am. Bk. Co.), $4.00; Harper: Dictionary of Classical Antiquities (Am. Bk. Co.), $6.00; Classical Atlas (Ginn), $1.25, or Kieppert's Atlas (Stechert), $1.75; Any standard Latin Grammar; Holmes: Caesar's Gallic War (Clarendon Press), $2.90; Abbott: History of Roman Political Institutions (Ginn), $1.50; Johnston: Roman Private Life (Scott, Foresman), $1.50; Johnston: Latin Manuscripts (Scott, Foresman), $2.25; Strachan-Davidson: Life of Cicero (Putnam), $1.50; Boissier: Cicero and His Friends (Putnam), $1.75; Glover: Studies

in Vergil (Arnold), $3.00; Guerber: Myths of Greece and Rome (Am. Bk. Co.); Miller: Two Dramatizations from Vergil (University of Chicago Press), $1.00; Fowler: History of Roman Literature (Appleton); Platner: Topography and Monuments of Ancient Rome (Allyn and Bacon), $3.00; Fowler: Julius Caesar (Putnam), $1.50, or Froude: Caesar, a Sketch (Scribner's); Judson: Caesar's Army (Ginn), $1.00; Davis: A Friend of Caesar.

For Teachers.—The Classical Journal, $2.00 per year, monthly (University of Chicago Press); The Classical Weekly, $2.00 per year (Professor Charles Knapp, Columbia University, New York); Game: Teaching High School Latin (University of Chicago Press), $1.00.

5. Spanish, 1-4 units. (Furnished by Associate Professor Benito Frances and Miss Rosalina Espiñosa.)

In New Mexico, more than in any other State, the pupil should learn to understand Spanish when spoken and to reproduce in Spanish, in writing and orally, what has been read.

First Year.—Coester: Spanish Grammar (Ginn); Bushee: Brief Spanish Grammar (Sanborn); Espiñosa and Allen: Spanish Grammar (Am. Bk. Co.); Hills and Ford: Revised Spanish Grammar (Am. Bk. Co.).

Any one of the above grammars furnishes enough material in Spanish grammar and composition for two years of high school Spanish. The exercises in Espiñosa and Allen's grammar are in the form of practical dialogues. Hills and Ford's elementary grammar may be supplemented by Hills: Tales for Beginners.

The oral repetition of an entire tale by members of the class is recommended. Simple selections of poetry from the readers should be memorized. This is the best way of attaining correct pronunciation and appreciation of the spirit of Spanish poetry. Each selection should be followed by an exercise in conversation based on the content of the selection.

Translating into English is often imperative for a correct understanding of the context but the conversation based on the text should constitute the principal part of the lesson.

The teacher should devote considerable time to a careful drill in verbs and troublesome pronoun forms.

Readers for First Year Spanish.—Harrison: Elementary Spanish Reader (Ginn); Espiñosa: Elementary Reader (Sanborn); Hall: Poco a Poco (World Book Co.); Worman: New First Spanish Book (Am. Bk. Co.).

Second Year.—In the second year Spanish literature should serve as a

basis for conversation and composition. Exercises in advanced prose composition should be given twice a week.

Newman: Spanish Daily Life; Taboada: Cuentos Alegres (Ginn); Alarcon: El Capitan Veneno (Holt); Wilkins: Elementary Prose (Sanborn); Espiñosa: Advanced Composition and Conversation (Sanborn); Valdez: La Hermana San Sulpicio (Heath); Galdos: Marianela (Am. Bk. Co.); Echegary: El Gran Galeoto (Koehler).

Third and Fourth Years.—Dorado: España Pintoresca (Ginn); Cervantes: Novelas Ejemplares (Am. Bk. Co.); Selections from the Literature of Cuba (Sanborn); Jorge Isaacs: Maria (Ginn); Lope de Vega: La Estrella de Sevilla (Sanborn); Martinez Sierra: Teatro de Ensueno (World Bk. Co.).

Periodicals for High Schools.—La Prensa, seminario Hispano, 24 Stone St., New York; Spanish Inter-America, 407 W. 107th St., New York; Revista Universal, 823 Park Row Bldg., New York.

Commercial Spanish.—Harrison: Spanish Commercial Reader (Ginn); Frontaura: En las Tiendas (Holt); McHale: Commercial Spanish (Heath); Whiten and Andrade: Spanish Correspondence (Heath).

Dictionaries.—New Spanish Dictionary (Appleton); Velasquez de la Cadena: New Pronouncing Dictionary (Appleton).

History of Spanish Literature.—Fitzmaurice Kelly (Appleton); Ticknor (Houghton).

Entertainments.—A social use of Spanish not only makes the study of the language more enjoyable, but creates sympathy with the races who speak it and broadens the student's outlook in life. Classrooms may be ornamented with pictures of Spanish subjects. A club may have a small museum with relics from Mexico, South America, and Spain. Clubs should give literary programs and plays at intervals. Suggestions may be obtained from the following:

Howland: Zaraguela (Am. Bk. Co.); Henry: Easy Spanish Plays (Holt).

III.

GROUP OF HISTORY, GOVERNMENT AND ECONOMICS.

One unit is required from this group for admission to the Colleges of Arts, Philosophy, and Science and Fine Arts and to Courses in Education and Home Economics, but students who intend to pursue the Course in Education are advised to offer two units, namely, Ancient History, United States History and Civics. There is no requirement in this group for entrance to the College of Engineering.

1. History. (Furnished by Associate Professor Walter Prichard.)

The aim in all high school history teaching should be to give the students a general knowledge and appreciation of the most important events and institutions which have ex-

erted a lasting influence upon the development of men in political and social groups. Details should be entirely omitted, except insofar as they are necessary to a thorough understanding of the larger topics.

Since a relatively small percentage of high school graduates ever enter college, it is best to proceed on the theory that the high school course in history which best prepares the student for life and citizenship, also best prepares him for college entrance. Hence it seems best to plan the high school course in history in such manner as to cover in a general way a large field rather than to cover more intensively a narrow and limited field of history.

When only one year's work is offered in history, this course should be a combination of ancient, medieval, and modern history. A proper division of time would be to devote a half-year to ancient and medieval, and a half-year to modern history. Such a course would involve a judicious selection of topics for consideration during the first half-year in order to adequately cover the field in that length of time. Only topics dealing with events, institutions, and struggles which have exerted a lasting influence, and which are indispensable to a thorough understanding of modern events and institutions should be emphasized. The chief emphasis should be laid on the development of institutions, while the military history is only important insofar as it has a direct bearing upon the development of later ideas and institutions. The contributions of Oriental nations to Greek and Roman civilization, of Greece and Rome to the middle ages, and of the middle ages to modern civilization should be the main topics to receive emphasis. The same general rule holds true in regard to the teaching of modern history. The emphasis should be increased as the present day is approached, since modern history is far more important for an enlightened attitude towards present-day problems than is either ancient or medieval history.

When only two years' work in history is offered, the second course should be United States history and civics. These subjects may each be pursued for a half-year, the history preceding the civics, or they may be combined into a full year's course, in the discretion of the teacher. The reason for the apparent subordination of United States history is not because it is any less important than the course

outlined above, but in view of the fact that American boys and girls get a smattering of United States history in the grades it seems better to offer them a broader course in general history than to offer them more United States history when they have no knowledge whatever of the history of the earlier periods or of other nations.

When three years' work is offered in history, one year should be devoted to ancient, one to medieval and modern, and one to United States history and civics, in the order named. But when four years' work is offered the sequence should be: Ancient, medieval and modern, English, and United States history and civics. Except in the last case, history should not be taught in the first year of the high school course. The writer is of the opinion that three years' work is preferable to four for two reasons, namely: English history is rather difficult for high school students and when English history is given, ancient history is crowded down into the first year. It is better to omit history from the first year so as to allow the student time to develop his ability to read intelligently and with discrimination before entering upon his history work, in which subject such ability is indispensable to satisfactory progress.

Good history teaching depends to a large degree upon the teacher, and we shall never have the proper kind of instruction in high school history until we abandon the pernicious and false notion that anyone can teach history. Many high schools have special teachers for languages, mathematics, science, etc., but parcel out the history courses to any of the teachers who happen not to have a full program. Until the same care is exercised in the selection of history teachers, the teaching of history will continue to be done in a haphazard and ineffective manner.

The work in each course should cover some standard textbook together with a considerable amount of collateral reading. If there is not a fair-sized library at the student's command, a book of readings should be placed in his hands along with the textbook. Wherever possible, outside readings and reports should be required from time to time on particular topics. This work is necessary to correct the false impression, which is likely to arise, that all the history of the period under study is contained in the textbook. For the best results, a school library suitable for collateral

reading should be in the school. Such a library can be built up gradually by the purchase of a few good books each year. Practically all the best textbooks contain lists of books suitable for supplementary reading, and from these lists teachers can make selections for the history section of their school libraries.

Map work should be carried on throughout each course so as to familiarize the students with the more important features of historical geography. Likewise, students should be compelled to learn the dates of the most important events in each course. These are the landmarks about which all historical knowledge must be grouped—the pegs upon which such knowledge is hung. Historical knowledge, which is not securely anchored in time and space, is practically useless. This work in map-making and learning dates need not be mere drudgery, but it should be insisted upon as of great importance. Practically all publishing houses handle outline maps for history, which are sold either singly or in sets for a small sum. These are highly satisfactory for filling in details, and the employment of them evades the drudgery of original map drawing. The map work in history should never be merely an exercise in drawing, but should be done for its value in fixing history in the minds of students.

The following textbooks and source books are indicated as examples of the amount and character of the materials for each unit, except that textbooks for civics are found elsewhere in this Manual:

1. **Ancient History.**—Botsford: History of the Ancient World (Macmillan); West: The Ancient World (Allyn and Bacon); Westerman: Story of Ancient Nations (Appleton); Wolfson: Essentials of Ancient History (Am. Bk. Co.); G. W. and L. S. Botsford: Source Book of Ancient History (Macmillan).

2. **Mediaeval and Modern History.**—Harding: New Medieaval and Modern History (Am. Bk. Co.); West: The Modern World (Allyn and Bacon); Myers: Mediaeval and Modern History (Am. Bk. Co.); Robinson: Readings in European History, Abridged Edition (Am. Bk. Co.); Ogg: Source Book of Mediaeval History (Am. Bk. Co.).

3. **English History.**—Wrong: History of the British Nation (Appleton); Cheyney: Short History of England (Ginn); Montgomery: English History (Ginn); Andrews: History of England (Allyn and Bacon); Walker: Essentials of English History (Am. Bk. Co.); Cheyney: Readings in English History (Ginn); Tuell and Hatch: Selected Readings in English History (Ginn).

4. **American History.**—James and Sanford: American History (Scribner's); McLaughlin: History of American Nation (Appleton); Hart: Essentials in American History (Am. Bk. Co.); Channing: History of the United States (Macmillan); Muzzey: American History (Ginn); Montgomery: Students' American History (Ginn); McLaughlin: Readings in History of American Nation (Appleton); Hart: Source Book of American History (Macmillan); James: Readings in American History (Scribner's); Muzzey: Readings in American History (Ginn).

2. Government and Economics. (Furnished by Professor Clarence E. Bonnett.)

Civics.

This course must not be confined to the study of the form of our government, but must investigate the functions that it performs and the manner in which it functions. Only modern texts should be used. Among the best of these are: Beard and Beard's American Citizenship (for first-year courses), Garner's Government in the United States, and Guitteau's Government and Politics in the United States. A copy of Macy and Gannaway's Comparative Free Government should be accessible to students.

Economics.

Acceptable work in this subject necessitates the use of a modern text like Johnson's Introduction to Economics, or Burch and Nearing's Economics, one of which must be mastered. Reference books should be available to the students.

REFERENCE BOOKS FOR THE HIGH SCHOOL LIBRARY.

After a text has been chosen, copies of other texts suggested below should be available for the pupils. The following are recommended, in the order given:

Civics.—Macy and Gannaway: Comparative Free Government, $2.25 (Macmillan); Beard: American Government and Politics, $2.10 (Macmillan); Young: The New American Government and Its Work, $2.25 (Macmillan); Hart: Actual Government, $2.25 (Longmans); Ashley: American Government, $1.00 (Macmillan); Bryce: American Commonwealth, Abridged Edition, $1.75 (Macmillan); Wilcox: Government by All the People, $1.50 (Macmillan); Ray: Introduction to Political Parties and Practical Politics, $1.50 (Scribner's); Jones: Readings on Parties and Elections in U. S., $1.60 (Macmillan); Howe: Modern City and Its Problems, $1.50 (Scribner's); Weyl: The New Democracy, $2.00 (Macmillan); Leacock: Elements of Political Science, $1.75 (Houghton); Garner: Introduction to Political Science, $2.50 (Am. Bk. Co.); Gettell: Problems in Political Evolution, $2.00 (Ginn); Fuller: Government by

the People, $1.00 (Macmillan); Bradford: Commission Government in American Cities, $1.25 (Macmillan); Beard: Readings in American Government and Politics, $1.90 (Macmillan); Dealey: Development of the State, $1.50 (Silver, Burdette & Co.); Goodnow: Politics and Administration in U. S., $1.50 (Macmillan).

Economics.—Ely: Outlines of Economics, 1916 Edition, $2.25 (Macmillan); Day and Davis: Questions on the Principles of Economics, $0.50 (Macmillan); Hamilton: Current Economic Priblems, $3.00 (University of Chicago Press); Fetter: Economics, Volumes I and II, $1.75 each (Century); Seligman: Principles of Economics, $2.50 (Longmans); Seager: Principles of Economics, $2.25 (Holt); Coman: Industrial History of the U. S., $1.60 (Macmillan); Taussig: Principles of Economics, $4.00 (Macmillan); Brisco: Economics of Business, $1.50 (Macmillan); Marshall, Field and Wright: Material for the Study of Elementary Economics, $3.00 (University of Chicago Press); Bullock: Selected Readings in Economics, $2.25 (Ginn); Herrick: History of Commerce and Industry (Macmillan); Chapin: An Historical Introduction to Social Economy (Century); Adams and Sumner: Labor Problems, $1.60 (Macmillan); Carlton: History and Problems of Organized Labor, $2.00 (Heath); Plehn: Introduction to Public Finance, $1.75 (Macmillan); Carver: Principles of Rural Economics, $1.35 (Ginn); Haney: Business Organization and Combination, $2.00 (Macmillan); Bullock: Introduction to the Study of Economics, $1.28 (Silver); Bogart: Economic History of the U. S., $1.75 (Longmans); Van Hise: Concentration and Control, $2.00 (Macmillan); Holdsworth: Money and Banking, $2.00 (Appleton).

IV.

GROUP OF MATHEMATICS.

(Furnished by W. E. Edington, sometime Professor of Mathematics.)

One unit of Algebra and one unit of Plane Geometry are required for entrance except to the College of Engineering, where the requirement is raised to one and one-half units in Algebra and the addition of Solid Geometry. A maximum of four units is accepted from this group, including elective offerings.

It is advised that the courses contained in this group be offered in the following order: First year, Algebra; second year, Plane Geometry; third year, Algebra completed and Solid Geometry. Students transferring from one school to another would thus be able to take up work where they left off without loss of time.

Algebra.—One unit. Elementary Algebra as far as Quadratics, including the elementary operations of polynomials and fractions, the solution of linear equations; simple factoring, simple powers, and roots. It is expected

that the work be accompanied by graphical methods in the solution of equations of all types, and in the explanations of other topics. Textbooks: Young and Jackson, Slaught and Lennes, Wells, Milne, etc.

Plane Geometry.—One unit. The work in Plane Geometry should cover a whole year's work in a good textbook and include the applications of algebra to geometry and geometry to algebra. Textbooks: Wentworth and Smith, Slaught and Lennes, Wells, Durell, Lyman, etc.

Third Year.—First half. Review of the first course in Algebra and thorough work on quadratic equations such as is covered by such textbooks as those named above.

Second half.—Solid Geometry. The textbooks are the same as those suggested for Plane Geometry.

Fourth Year.—One half-year of Advanced Algebra and the other half-year of Plane Trigonometry. Textbooks for Advanced Algebra: Ashton and Marsh, Hawkes, Luby and Touton, Rietz and Craithorne. Textbooks for Trigonometry: Crawford, Wilczynski, Granville.

Advanced Arithmetic, which is generally only a review of grade arithmetic, is accepted as an elective for entrance to the University but it may not be substituted for any subject in the prescribed list. No advanced standing will be given by the University for any course in high school mathematics.

A MATHEMATICAL REFERENCE LIBRARY.

Ball: History of Mathematics, $0.65 (Macmillan); Cajori: History of Elementary Mathematics, $1.50 (Macmillan); Klein: Famous Problems of Elementary Mathematics (translation by Beman); Ball: Mathematical Recreations and Essays, $2.25 (Macmillan); Schubert: Mathematical Essays, $0.75 (Open Court); White: Scrapbook of Elementary Mathematics; Young: Teaching of Mathematics, $1.00 (Longmans); Young: Fundamental Concepts of Algebra and Geometry, $1.60 (Macmillan); Abbott: Flatland, A Romance of Many Dimensions; Conant: The Number Concept, Its Origin and Development, $2.00 (Macmillan).

EQUIPMENT AND APPARATUS FOR MATHEMATICS.

The importance of the graphic method in the teaching of elementary algebra is becoming more and more recognized. For this work a carefully and accurately scaled blackboard is essential. This board may be painted on the regular blackboard without much expense. The unit should be of such size, say an inch, as to permit within a reasonable space a considerable range of variation for the variables.

The cross-section lines should be drawn accurately and fine.

In the study of plane geometry a sufficient supply of wooden blocks should be on hand to illustrate and verify most of the theorems on areas. For the study of solid geometry models in both wood and tin are valuable in aiding the demonstration of theorems on surfaces, volumes, and the relations between solids of different types. Among these models should be pyramids and prisms, cones and cylinders, of tin, having equal bases and altitudes, sectional prisms and spheres, and a set of blocks to illustrate the squaring and cubing of numbers, etc. A good, mounted spherical blackboard is very helpful in the study of the sphere.

This equipment may be obtained of any general school supply company, such as the A. Flanagan Company of Chicago.

GROUP VA.

LABORATORY SCIENCES.

One unit of laboratory science is required for entrance to all Colleges and Schools of the University, and in the case of the School of Applied Science this should be Physics.

A high school science, in order to be accepted as a laboratory science, must be truly scientific in its nature and must represent some real laboratory work. Real laboratory work involves the development of the power to observe carefully and correctly the phenomena of science and to state clearly the deductions drawn therefrom. Where resources are limited it is hoped that high schools will concentrate upon one science and give that course with as complete laboratory equipment as possible rather than to undertake several with adequate equipment for none of them.

1. Botany, ½-1 unit. (Furnished by Professor A. O. Weese.)

This subject should be offered in the second, third, or fourth year.

A knowledge of the general structure of plants and of the principal organs and their functions is required. This should be based upon practical work in the laboratory, and to some extent, at least, in the field. The student should have a general knowledge of the main groups of plants and

a ready recognition of those families represented in the local flora, gained by practice in the identification of common species. A notebook with a record of all original work done by the student should be required. All notes should be permanently preserved in neat form and all drawings should be made with a hard pencil on a good quality of drawing paper.

2. Biology, 1 unit. (Furnished by Professor A. O. Weese.)

This course belongs in the first or second year if other laboratory sciences are offered and should include the essentials of Botany, Zoology, and Physiology and should be so treated as to correlate these main divisions of the subject. Constant laboratory or field work is essential. As a rule the student should perform his own experiments and much of the work should be of such a nature as to be capable of repetition at home. The biological relations of plants and animals and their importance in the inter-daily life of man are to be emphasized. For further information as to laboratory work, notebooks, etc., see the sections on Bot any, Physiology, and Zoology.

3. Physiology, ½ unit or 1 unit. (Furnished by Professor A. O. Weese.)

This subject should be offered in the second, third, or fourth year.

The emphasis should be placed upon Physiology proper, viz., the mechanism of the phenomena of life and the functions of the various organs of the human body; but in connection with this the pupil should learn accurately such anatomical facts as are fundamental to the understanding of the functions of the organs. Laboratory work on some such animal as the frog is recommended as an aid to the teaching of anatomical facts. The dissection of a mammal is too difficult to be attempted by the ordinary high school class, although if there is ample time the instructor may demonstrate mammalian structure by the dissection of the viscera of the cat. The student should also receive definite and practical instruction in the more important phases of personal and public hygiene, i. e., the sources of infection for typhoid, diphtheria, tuberculosis, or other infectious diseases, and how to avoid these infections, the care of the sick, etc.

For more than one-half unit the course MUST include practical laboratory work. Carefully written notes and drawings should be made, and these should be frequently criticised by the teacher. The laboratory work should occupy about one-half the time of the entire course.

4. Zoology, ½ unit or 1 unit. (Furnished by Professor A. O. Weese.)

The instruction must include laboratory work equivalent to four periods a week for a half-year, besides the time required for textbook and recitation work. Notebooks and drawings must be presented to show the character of work done and the types of animals studied. The drawings are to be made from the objects themselves, not copied from illustrations, and the notes are to be a record of the student's own observations of the animals examined. Drawing should be used as a means of testing the correctness of observations, not primarily as a means of record. The amount of equipment and the character of the surroundings must, of course, determine the nature of the work done and the kind of animals studied; but in any case the student should have at least a fairly accurate knowledge of the external anatomy of each of eight or ten animals distributed among several of the larger divisions of the animal kingdom, and should know something of their life histories and of their more obvious adaptations to environment. It is recommended that special attention be given to such facts as can be gained from a careful study of the living animal. The names of the largest divisions of the animal kingdom, with their most important distinguishing characters, and with illustrative examples selected, when practicable, from familiar forms, ought also to be known.

EQUIPMENT FOR BIOLOGICAL SCIENCES.

(Furnished by Professor A. O. Weese.)

The amount and nature of laboratory equipment necessary for the proper presentation of any of the laboratory sciences will necessarily vary with the content of the course, the conditions under which the course is given, and the textbook and laboratory manual used. For that reason it is impossible to give a list which will be equally useful in all cases. Most of the textbooks and laboratory manuals designed for high school use contain a list of apparatus de-

signed for use in a course following that book. These estimates are usually based on a class of ten or twelve. Although smaller amounts of some of the articles would be sufficient for a smaller class, in most cases it is uneconomical to buy in smaller lots. Much of the apparatus named in such a list and in the list to follow may be used in common with the classes in the other sciences, such as physics and chemistry, at least one of which is offered in all high schools. In the following list the articles used by classes in botany only are indicated by an (A), those by zoology classes only by a (B), by physiology classes only by a (C), those used by zoology or botany classes in common with classes in physics or chemistry by a (D). Equipment for a class of ten students is suggested as follows:

1 Balance—Harvard trip scale—with metric weights (D).
1 Bell jar (D).
10 Wide mouth bottles (may be obtained by students at drug store).
25 250cc glass stoppered bottles for stock solutions. (Cheaper cork stoppered bottles may be obtained at any drug store.)
100 Test tubes, 6″ x¾″ (D).
2 Graduated cylinders, 100 cc and 500 cc (D).
1 Package filter paper, 300 mm. (D).
10 Erlemmeyer flasks, 500 cc. (D).
2 Glass funnels, 50 and 150 mm. diameter (D).
30 Petri dishes, 100 mm.
10 ft. glass tubing, soft, sizes 2, 3, 4, 5, 6, assorted (D).
1 Aquarium jar, 10 liters.
12 Mason jars, quarts.
12 Mason jars, pints.
10 Magnifiers, tripod form.
1 Compound microscope. (This is important.)
10 ft. rubber tubing to fit glass tubing (D).
1 Chemical thermometer, graduated to 100° C. (D).
15 Agate ware of tin trays about 350 mm. long by 150 mm. wide. (May be obtained at hardware store.) (B).
1 Razor for cutting sections.
1 Support stand with rings (D).
1 Test tube rack (D).
5 Test tube brushes (D).
2 Books litmus paper (D).
10 Syracuse watch glasses.
1 Steam sterilizer (tin will do). (A), (C).
1 Alcohol lamp (D).
1 Gross slides.
2 Oz. cover slips, 223 mm. square.
1 Mortar and pestle (D).
2 Medicine droppers.
10 Pairs scissors.

10 Pairs forceps.
20 Needles in handles.
10 Scalpels.
1 Gal. 95% alcohol (not denatured).
1 Quart formalin.
1 oz. Iodine (D).
1 oz. Potassium iodide (D).
6 oz. Nitric acid (D).
6 oz. Ammonium hydroxide (D).
6 oz. Benzole or xylol (D).
6 oz. Chloroform (D).
½ lb. Copper sulphate (D).
½ lb. Sodium hydroxide (D).
½ lb. Rochelle salts (D).
6 oz. Glycerine (D).

It will be found, in any course, that a few necessary articles and chemicals are not provided for above, but they will be generally of such a nature that they can be obtained easily in some local store, or improvised by the teacher. In addition, there should be, if possible, a small collection of typical animals and plants, many of which can be collected locally. The teacher should make a list before school begins, of the laboratory material he wishes to use during the course and obtain it in advance. It is impossible to furnish such a list here. The local resources in zoological material may be well supplemented by a collection such as the following:

Grantia, sea anemone, sea urchin, starfish, clam, slug, earthworm, sandworm, crayfish, honey bee, June beetle, adult and larva, cicada, locust, nymph and adult, centipede, garden spider, frog, two stages tadpoles.

This collection is offered by a reliable dealer at $1.30 (name on request). If the school is able to purchase more material, enough for dissection of many of the type forms may be obtained very reasonably.

If money is available for equipment in physiology, much of it should be spent in models and charts, with a few microscopic slides of typical organs.

The Department of Biology of the University will be very glad to advise individual high schools as to their purchase of equipment. In this case special attention can be paid to the individual needs and resources of the school in question.

5. Geology, ½-1 unit. (Furnished by C. T. Kirk, sometime Professor of Geology.)

The student should show familiarity with the principles of dynamic and structural geology, and some acquaintance with the facts of historical geology, as presented in Scott: Introduction to Geology; Brigham: Textbook of Geology; or Blachwelder and Barrows: Elements of Geology, or an equivalent with notebook of laboratory together with field work. The laboratory and field work should follow one or more of the lines indicated below, and notebooks should be presented showing the character and amount of work done. (a) Studies of natural phenomena occurring in the neighborhood which illustrate the principles of dynamic geology. Each study should include a careful drawing of the object and a written description of the way in which it was produced. (b) Studies of well-marked types of crystalline, metamorphic, and sedimentary rocks which will enable the student to recognize each type and state clearly the conditions under which it was formed. (c) Studies of the types of soil occurring in the neighborhood, including the origin of each and the cause of difference in appearance and fertility.

6. Physical Geography, ½-1 unit. (Furnished by C. T. Kirk, sometime Professor of Geology.)

The amount and character of the work that should be attained may be seen by referring to the texts of Gilbert and Brigham, Davis, Tarr and Martin, etc. The recitations must be supplemented by at least an equal amount of time devoted to laboratory work. The laboratory exercises should follow one or more lines as indicated below. Each student should present a notebook showing what he has done. (a) Studies in mathematical geography in which map and scale only are used. These should embrace such topics as length of a degree of longitude in various latitudes; length and breadth of continents, etc., in degrees and miles; relative latitudes of places; distance between cities, etc., in degrees and miles; difference in length of parallels and meridians; problems in time; location of time belts, etc. (b) Studies of local topographical features which illustrate the various phases of stream work. Each study should include a drawing or topographic map of the object, and a full, clear description of the way in which it was formed. (c) Studies of glacial deposits as shown in terminal and ground moraines, kames, eskers, etc.; distri-

bution of dark and light colored soils; occurrences of lakes, ponds, gravel beds, clay banks, and water-bearing strips of sand and gravel. (d) Studies of stream work as shown in the topographical sheets which may be obtained from the United States Geological Survey at a nominal cost. (e) Studies of the form, size, direction, and rate of movement of high and low barometer areas, and the relation of these to direction of wind, character of cloud, distribution of heat, and amount of moisture in the air, as shown by the daily weather maps. Later these studies should lead to the making of weather maps from the data furnished by the daily papers, and to the local prediction of weather changes based on the student's own observation. (f) Studies of the climate of various countries compared with our own, the necessary data being derived from such topographic, wind, current, and temperature maps as are found in Sydow-Wagner's or Longman's atlases.

EQUIPMENT FOR GEOLOGY AND PHYSICAL GEOGRAPHY.

A hand lens, magnet, and hammer are indispensible. These can be obtained from the Ward Natural Science Co., of Rochester, N. Y., which also is able to provide a case of minerals at small cost. A streak plate and scale of hardness are valuable and may be obtained from the Braun Corporation of Los Angeles or the Central Scientific Co. of Chicago.

7. Chemistry, 1 unit. (Furnished by Professor John D. Clark.)

The instruction must include both textbook and laboratory work, so organized that at least one-half of the time shall be given to the laboratory. The course as it is given in the best high schools throughout one year will satisfy the requirements of the University of one unit of a laboratory science. The notebook, bearing the instructor's endorsement, should be presented as evidence of the actual laboratory work accomplished.

So many textbooks contain a full list of the laboratory equipment needed for such a course that it is not felt necessary to give such a list here.

BOOKS ON CHEMISTRY SUGGESTED FOR A HIGH SCHOOL REFERENCE LIBRARY.

Newell: General Chemistry (Heath); Newell: Descriptive Chemistry (Heath); Hessler and Smith: Essentials of Chemistry (Sanborn); Linebarger: Elementary Chemistry (Rand,McNally); Remsen: Introduction to Chemistry (Holt); Avery: School Chemistry, $1.20 (Am. Bk. Co.);

Arey: Elementary Chemistry, $0.90 (Macmillan; McPherson and Henderson: Elementary Chemistry, $1.25 (Ginn); Godfrey: Elementary Chemistry (Longmans); Morgan and Lyman: Chemistry, an Elementary Textbook, $1.25 (Macmillan); Bradbury: Inductive Chemistry (Appleton); Brownlee and Others: First Principles of Chemistry, $1.25 (Allyn and Bacon); Smith: Elementary Chemistry (Century); Blanchard and Wade: Foundations of Chemistry (Am. Bk. Co.); Brownlee and Others: The Chemistry of Common Things (Allyn and Bacon); Weed: Chemistry in the Home.

The above are texts. For profitable reading in connection with a course in Chemistry, the following:

Duncan: The Chemistry of Commerce; Lassar-Cohn: Chemistry in Daily Life; Phillips: The Romance of Modern Chemistry; Bird: Modern Science Reader, $1.10 (Macmillan); Martin: Triumphs and Wonders of Modern Chemistry; Butler: The Story of Paper Making; Nicolls: The Story of American Coals; Sadtler: Chemistry of Familiar Things; Von Schwartz: Fire and Explosion Risks; Baskerville: Municipal Chemistry.

Physics, 1 unit. (Furnished by J. L. Brenneman, sometime Professor of Physics.)

If Physics is offered towards entrance to the University as the required unit in laboratory science, the student must actually have had laboratory work and must have performed at least thirty-six experiments, similar to those found in Millikan, Gale, or Bishop's laboratory manual. The student may be asked to show his notebook in order to receive entrance credit in this subject. If physics is offered as an elective science, the laboratory work will not be required, but it is strongly advised that the laboratory work be in no case omitted. The class should meet at least five times a week, divided between at least three recitation periods, each of at least 40 minutes in length, and one or two laboratory periods of 85 minutes in length.

When Physics is offered for entrance to the School of Applied Science, the course must be of the highest standard and in order that it may be thorough, it should not be taken before the fourth year. The candidate is required to present his notebook as evidence of the quality of the work attained. A thorough course in Physics is indispensable as a foundation for the study of the various branches of engineering. When such a course is not to be had in the preparatory school the student must take it in his first year at the University and in such cases it is preferable that the candidate should offer some other laboratory science for entrance instead of inadequate work in Physics.

EQUIPMENT FOR HIGH SCHOOL PHYSICS.

Following is a list of laboratory equipment which high schools should provide for students in Physics, in order that the work may be of standard grade. To the left is given in the first column the number of pieces of apparatus required for a class of two students or where only one experiment is performed at a time. The second column shows the number of pieces needed if the class consists of ten students or more, so that four or five experiments, all different, may be performed at the same time. To the right are found the approximate minimum and liberal prices for the equipment necessary for a class of two students. The teacher must use some discretion in the selection of equipment so that it will be commensurate with the available sources of heat and power. Prices are omitted when they are indefinite. Some prices vary a great deal with market conditions.

I. General Equipment.

1	3	Meter sticks	$ .25	$ .60
1	2	Laboratory balance	10.00	20.00
1	3	Sets iron metric weights	1.50	3.00
1	1	Iron weight (2 kilograms)	.50	1.00
1	1	Loud ticking clock, seconds pendulum, or stop watch	5.00	20.00
2	5	Pounds of lead shot	.....	.....
1	2	Battery jars, 6″ x8″	.20	.40
2	4	Pounds of mercury (market price variable	.....	.....
1	1	Set tripods and clamps, wire gauze	2.00	20.00
1	2	Vernier calipers	2.00	5.00
1	1	Funnel	.10	.50
1	1	Micrometer calipers	5.00	10.00
1	1	Set iron weights (English)	2.00	4.00

II. Mechanics.

1	1	Brass disc	$ .10	$ .25
2	4	Hollow brass cylinder, glass cover	.35	.75
1	1	Steel spheres (¾″ diameter, or several small ones)	.25	1.00
3	3	Spring balances (limit 2000 grams)	.40	.75
1	1	Aluminum cylinder	.30	.60
1	1	Inclined plane with pulley	.90	2.00
1	1	Carriage for inclined plane	1.00	1.50
1	1	Mirror scale with support	.60	1.00
1	1	Spring and weight holder, for Hooke's Law	.15	.30
1	1	Demonstration balance for showing principle of balance	.60	1.00
1	1	Water-proof wooden cylinder	.15	.50
1	1	Force board for mounting balances	1.00	3.00
1	1	Spring balances (15 kg.)	1.50	3.00

III. Liquids and Gases.

1	1	Glass manometer tube (for comparing density of liquids)	$ .25	$ 2.00
1	1	Glass manometer tube (for measuring pressure beneath surface of liquid)	.20	.50
1	1	Constant weight hydrometer tube	.20	.60
1	1	Constant volume hydrometer tube	.20	.50
1	1	Constant weight hydrometer (commercial form for light liquids)	.35	3.50
1	1	Wooden block, parafined	.10	.20
1	1	Boyle's Law tube	1.25	3.00
3	3	Evaporating dishes	.30	....
1	1	Dew point apparatus	1.00	2.00
3	6	Thermometers	.90	7.50
1	1	Graduated glass cylinder (500 cc.)	1.00	2.00
1	1	Graduated glass cylinder (100 cc.)	.75	1.50
1	4	Beakers	.....	.....
1	1	Bottle with ground glass stopper	.10	.25

IV. Heat.

1	1	Volume coefficient expansion of air	$ 1.50	$ 5.00
1	3	Steam generator	2.00	3.00
1	1	Coefficient of expansion of metal rod or tube	.50	7.00
2	6	Calorimeters (double walled preferred)	1.00	8.00
1	5	Bunsen burners, or some form of lamp or torch	.....	.....
100	200	Grams of aluminum, brass or zinc for specific heat experiment	.....	.....
1	1	Apparatus for pressure coefficient of gas	1.50	5.00
1	1	Tube for mechanical equivalent of heat	.50	1.00
1	2	Oz. acetamide for showing cooling through change of state	.....	.....

V. Electricity.

2	4	Bar magnets	$ .30	$ .80
		Iron filings	.....	.....
2	2	Horseshoe magnets	.30	.80
1	4	Compasses	1.00	2.00
1	1	Lb. No. 18 cotton covered copper wire	.....	.....
1	1	Lb. No. 26 cotton covered copper wire	.....	.....
1	1	Oz. German silver wire	.....	.....
		Two sizes steel piano wire	.....	.....
1	1	Electroscope	.50	5.00
		Friction set (glass rod, sealing wax, silk and flannel)	.....	.....
1	1	Simple condenser	.25	1.00
1	1	Proof plane	.25	.50
1	2	Simple galvanometer or galvanoscope	1.00	10.00
1	1	Student's D'Arsonal galvanometer	2.00	10.00
1	1	Set resistance coils, 1000 ohms, 1 ohm, etc., battery elements, lead, zinc, carbon, aluminum, iron, copper	.....	.....
		Coils to demonstrate principle of induction	..... 1.50	3.00

1	1	Electric bell	1.50	3.00
2	4	Push buttons or switches	.15	.60
1	1	Toy motor	1.00	5.00

VI. Sound.

1	1	Tuning fork, 256 vibrations	$ .50	$ 3.00
1	1	Tuning fork, 384 vibrations	.35	2.50
1	1	Tuning fork, 512 vibrations	.25	2.50
1	1	Sonometer (attachment for inclined plane or separate)	.20	12.00
1	1	Vibrograph	3.00	6.00
1	1	Tuning fork for above	1.00	2.00

VII. Light.

2	4	Glass prisms	$ .90	$ 1.75
1	1	Protractor	.25	5.00
2	4	Linen testers	.75	1.50
1	2	Convex lens	.30	.80
1	1	Simple photometer	.75	5.00
5	5	Candles	.10	.25

DEMONSTRATION APPARATUS.

While the laboratory equipment for class use is very essential in order that the student may have experience in actually performing the experiments, the demonstration equipment, handled by the teacher before the whole class, is a valuable adjunct in teaching Physics as it serves to add interest and definiteness to the theory which is being discussed. The second step in providing equipment should, therefore, be to collect an assortment of apparatus for demonstration, which is here listed under appropriate headings. It is intended that the appropriation be distributed among the various divisions of the subject and that the selections in each division be made from the top of the list to the bottom approximately in the order in which they occur. The list is not intended to be rigid or exhaustive. The teacher must use discretion in making selections and at the same time see that auxiliary equipment is on hand or provided. For example, an X-ray tube is of no value without some source of high voltage, such as an induction or Testa coil. The following apparatus will serve the needs of a class of any size:

I. Mechanics.

Mechanical rotator	$ 5.00	$10.00
Electrical rotator	30.00	75.00
Inclined plane for demonstration of acceleration	4.00	12.00
Metronome for above	2.00	5.00

Double pulley	.....	.....
Triple pulley	.....	.....
Set of collision balls	3.00	15.00
Guinea and feather tube	5.00	8.00
Litre block	.50	3.00
Metric chart	1.00	3.00
Glass globe for rotation	1.00	3.00
Bow and Chladni plate	3.00	5.00
Joly spring balance	10.00	30.00

II. Liquids and Gases.

Siphon apparatus	.....	.....
Pascal's vases	$ 5.00	$12.00
Mercury well for barometric experiment	.10	.50
Barometer tube or barometer	.60	40.00
Vacuum pump	8.00	60.00
Globe for weighing air	.....	.....
Seven in one apparatus (hydrostatic and pneumatic bellows)	6.00	10.00
Set of capillary tubes	.50	1.00
Discs for showing adhesion of glass and water	.25	.75
Osmose cup	.....	.....
Hare's apparatus for showing specific gravity of liquids...	1.50	5.00
Set of tubes showing equilibrium of liquid columns of different shapes	.50	1.00
Glass models of hydraulic press and pumps	.....	.....
Bell jars for vacuum pumpstand	.....	.....
Intermittent siphon	.....	.....
Cartesian diver	.10	.25
Pascal's Law tubes	.....	.....
Hydraulic ram	.....	.....

III. Heat.

Air thermometer	$ .10	$ .25
Compound bar, showing difference in expansion of two metals	.75	1.50
Ball and ring for showing expansion by heat	1.50	2.00
Convection apparatus	.....	.....
Pulse glass	.50	1.00
Fire syringe	1.00	3.00
Cryophorons (require ice)	1.00	3.00
Maximum and minimum thermometer	3.00	12.00
Model of steam engine	.....	.....
Small steam engine	.....	.....
Small gas engine	.....	.....
Governor for rotator	.....	.....

IV. Electricity.

1. MAGNETISM:

Lecture table compass, mounted	$ .50	$ 1.50
Samples of hard and soft iron or steel	.....	.....
Floating magnets	.....	.....
Dip needle	2.00	4.00

2. ELECTROSTATICS:

Electrostatic machine	$15.00	$40.00
Electroscope, well insulated	2.00	10.00
Attachments for same	.....	.....
Electrophorous	2.00	5.00
Demonstration set on laws of electrostatics (hollow globe, cylinder, Leyden jars, electric whirl, stands, etc.)	.....	40.00

3. ELECTROKINETICS:

Dry, gravity, and storage cells	$ 2.00	$50.00
Electromagnet	1.00	5.00
Dissectable electric motor	2.50	5.00
Lecture table galvanometer	5.00	20.00
Ampere's frames	8.00	15.00
Model transformer	5.00	15.00
Telegraph set	.....	.....
Telephone set	.....	.....
Induction or Testa coil	4.00	100.00
Electrolysis apparatus	.....	.....
Voltmeters and ammeters	.....	.....
Resistance boxes or postoffice box	.....	.....
Hand generator or motor generator for direct current	10.00	100.00

V. Sound.

Siren disc	$ 1.00	$ 2.00
Wave motion apparatus	.50	15.00
Parabolic reflectors	.....	.....
Bell in vacuo	2.00	5.00
Set sympathetic forks	10.00	20.00
Manometric flame	3.00	15.00
Mirror for rotation	2.00	5.00
Sound lens	.....	.....
Singing flame apparatus	2.50	5.00
Set tuning forks (mounted or unmounted)	5.00	75.00
Kundt's tube	2.00	16.00
Organ pipes	1.00	10.00
Foot bellows	8.00	15.00
Chladni's plates and holder	2.00	10.00

VI. Light.

Hartl optical disc and accessories	$15.00	$40.00
Set color discs	1.00	3.00
Set lenses	1.50	5.00
Tourmaline tongs or two Nicol prisms	3.50	18.00
60 degree prism	1.50	12.00
Replica grating	5.00	.....
Demonstration lenses	1.00	5.00
Achromatic lenses	2.00	5.00
Projection lantern	20.00	300.00
Heliostat	15.00	150.00
Telescope	2.00	30.00
Spectrum charts	1.00	10.00
Spectroscope or spectrometer	7.00	100.00

VII. Radiation.

Leslie's differential thermometer	$ 2.00	$ 5.00
Parabolic reflectors	.....	.....
Sympathetic electric resonators	5.00	15.00
Vacuum tubes, showing phenomena of electric discharge	1.00	50.00
For X-ray demonstration	2.00	15.00
Wireless telegraphy	10.00	50.00
Geisler tubes	.25	10.00
Crooke's radiometer	1.50	2.50
Spinthoriscope	8.00	10.00
Fluoroscope	5.00	12.00

Note.—For a list of supply houses see page 19.

PHYSICS LIBRARY LIST.

(The books and periodicals given below are divided into elementary and advanced lists, the former for the use of students of average ability and the latter for the instructor and those students who have unusual interest in some particular phase of the subject.)

A. Most Common Textbooks of High School Grade.

Millikan and Gale: First Course in Physics, $1.25 (Ginn), 1913; Carhart and Chute: First Principles of Physics, $1.25 (Allyn and Bacon), 1912; Crew: Elements of Physics, $1.10 (Macmillan), 1909; Hall and Bergen: Textbook of Physics; Hoadley: Essentials of Physics, $1.25 (Am. Bk. Co.), 1913; Hoadley: Elements of Physics, $1.20 (Am. Bk. Co.), 1908; Mann and Twiss: Physics, $1.25 (Scott, Foresman), 1910; Adams: Physics for Secondary Schools, $1.20 (Am. Bk. Co.), 1908; Coleman: Elements of Physics, $1.25 (Heath), 1906; Wentworth and Hill: Textbook of Physics.

B. Laboratory Manuals for High Schools.

Millikan, Gale and Bishop: A First Course in Laboratory Physics for Secondary Schools, $0.50 (Ginn), 1914; Millikan and Gale: A Laboratory Course in Physics, for Secondary Schools, $0.40 (Ginn), 1906; Adams: Physical Laboratory Manual for Secondary Schools, $0.75 (Am. Bk. Co.), 1909; Gage: Physics Laboratory Manual; Chute: Physical Laboratory Manual; Coleman: New Laboratory Manual of Physics, $0.60 (Am. Bk. Co.), 1909; Chester, Dean and Timmerman: Laboratory Manual; Hoadley: Practical Measurements in Electricity and Magnetism, $0.75 (Am. Bk. Co.), 1904; Twiss: Laboratory Manual; Everett: Illustrations of C. G. S. System of Units, $1.25; (Macmillan); Nichols, Smith and Thurton: Manual of Experimental Physics.

C. Texts of College Grade for Reference.

Duff: Textbook of Physics (Blakiston's), 1912; Reed and Guthe: College Physics (Macmillan), 1915; Barker: Physics; Daniell: Principles of Physics; Hastings and Beach: General Physics; Carhart: University Physics; Wood: Physical Optics; Preston: Theory of Heat; Hoskins: Textbook of Hydraulics.

D. Easy General Reading.

Cajori: History of Physics (Macmillan); Casson: History of the Telephone; Bowie: Practical Irrigation; Bishop: The Panama Gateway;

Lodge, Sir Oliver: Electrons: The Nature of Negative Electricity (Macmillan); Schuster: Progress of Physics During 32 Years (1875-1908) (Cambridge Press); Cox: Beyond the Atom (Cambridge Press); Duncan: The New Knowledge (Radio-activity, electrons, etc.).

E. More Advanced General Reading.

Rutherford: Radio-Activity; Thomson: Conduction of Electricity Through Gases (Cambridge Press); Campbell: Modern Electrical Theory (Electrons) (Cambridge Press); Soddy: Chemistry of the Radio-Active Elements, Parts I and II (Longmans); Michelson: Light Waves and Their Uses (University of Chicago Press); Richardson: The Electron Theory of Matter (Putnam); Burgess and Le Chatelier:The Measurement of High Temperatures; Franklin: Electric Lighting; Ferguson: Elements of Electrical Transmission; Kershaw: Electro-Metallurgy (Von Nostrand); Jansky: Electrical Meters (McGraw, Hill); Harding: Electric Railway Engineering (McGraw, Hill); Buck: The Electric Railway (McGraw, Hill).

F. Periodicals.

PART I. HIGH SCHOOL GRADE.

School Science Monthly; School Science and Mathematics, $2.00; Scientific American, $3.00; Scientific American Supplement, $5.00; Popular Mechanics, $1.50; Popular Science Monthly and Popular Electricity, $1.50; Illustrated World (formerly Technical World), $1.50.

PART II. COLLEGE GRADE.

I. Physics.—Physical Review, $6.00; Astrophysical Journal; Philosophical Magazine, $5.00; Science, $5.00.

II. Electrical Engineering.—Electrical World, $3.00; Electrical Review and Western Electrician, $3.00; General Electrical Review, $2.00; Electric Journal, $2.00; London Electrician, $8.00.

III. Civil Engineering.—Engineering News, $5.00; Engineering Record, $3.00.

GROUP VB.

NON-LABORATORY SCIENCES.

This group consists of any subject contained in Group 5A, if given with inadequate laboratory facilities and practice, and also general science, astronomy, and psychology. Ordinarily, courses in these last three subjects are given negligible laboratory work, but it is possible that general science and astronomy be taught with adequate laboratory and practice and thus be classified as laboratory sciences.

1. General Science, ½ unit.

There exists up to the present time such a variety of opinion on what the content and aim of a course in general science should be and as yet no standardization for such a

course has been reached. Courses up to this time exhibit a tendency to develop superficiality, for the student is liable, after taking such a course, to feel that he has a much broader acquaintance with the sciences than he actually possesses. The Faculty of the University, therefore, are of the opinion that the subject of general science should receive recognition and credit for entrance to the University only after the student, who applies for credit in this subject, gives evidence that he has derived real benefit from the course which he has pursued.

2. Astronomy, ½ unit.

A high school course in this subject should aim not only to impart a knowledge of the descriptive matter in a good textbook, but also some practical familiarity with the geography of the heavens, with the various celestial motions, and with the positions of the heavenly bodies conspicuous to the naked eye. The textbook should be supplemented by charts, maps, and observations with the telescope.

BIBLIOGRAPHY FOR ASTRONOMY.

Ball: Elements of Astronomy, $0.80 (Macmillan); Ball: Star-Land, $1.00 (Ginn); Bowen: Astronomy by Observation, $1.00 (Am. Bk. Co.); Byrd: Laboratory Manual in Astronomy, $1.25 (Ginn); Green: Introduction to Spherical and Practical Astronomy, $1.50 (Ginn); Lockyer: Astronomy, $0.35 (Am.Bk. Co.); Lowell: Evolution of Worlds, $2.50 (Macmillan); Milham: How to Identify the Stars, $0.75 (Macmillan); Newcomb: Elements of Astronomy, $1.00 (Am. Bk. Co.); Steele: Popular Astronomy, Revised by Todd, $1.00 (Am. Bk. Co.); Todd: New Astronomy, $1.30 (Am. Bk. Co.); Upton: Star Atlas, $2.00 (Ginn); Willson: Laboratory Astronomy, $1.25 (Ginn); Young: Lessons in Astronomy, $1.25 (Ginn) (Note: This is an elementary textbook.); Young: General Astronomy, $2.75 (Ginn) (Note: This is advanced. Serviceable for reference.)

3. Psychology, ½ unit. (Furnished by Professor D. A. Worcester.)

Students who expect to attend college are advised not to take Psychology in high school, but the subject is accepted towards entrance to the University as an elective science. One-half unit is allowed for the completion of some such textbook as Halleck: Psychology and Psychic Culture, or Pillsbury: Essentials of Psychology.

REFERENCE LIBRARY FOR TEACHERS.

Angel: Psychology (Holt); James: Psychology, Briefer Course (Holt); Colvin: The Learning Process (Macmillan); Claparede: Experimental Psychology (Longmans); Kirkpatrick: Fundamentals of Child Study (Macmillan).

LIST C.

This list consists of various industrial subjects and music. A maximum of four units is accepted towards entrance to the University as elective offerings and the maximum amount that is acceptable in each subject of the list is indicated in each case.

1. Agriculture, ½-2 units. (Furnished by the New Mexico College of Agriculture and Mechanic Arts, State College, New Mexico.)

The past few years have seen a widespread movement for the introduction into the rural and high schools of the country subjects relating to agriculture. New Mexico is not far behind the other states in this matter, yet there is no manual or outline for the teacher to follow in giving these courses.

Agriculture is a progressive science, covering a large and broadening field. Therefore, the courses must be more or less elastic, for the things that apply today may be obsolete tomorrow. That is to say, hard and fast rules can not be used in agriculture as in mathematics or engineering, but there are principles upon which the rules can be based.

Agriculture is too complex for all its details to be mastered by one person. The expert in crops or soils may not possess more than a general knowledge of livestock, fruit-growing, or dairying; therefore, some sort of outline must be followed with a view of standardizing the study. The development of agricultural high schools and agricultural courses in the regular high schools has been so rapid in the past few years that instructors with suitable training have been hard to secure, and consequently instructors without the necessary training in the fundamentals of scientific agriculture have attempted to teach the subject with the inevitable result—failure to stimulate interest in the students. The benefits that the students get from the study of agriculture depend to a large extent on the instructor; if he has had good training and is enthusiastic he will be sure to stimulate interest in his pupils and the resulting good will be great, but if he has to confine himself to the text or outline he will find that the benefits the pupils derive from such a course will be few.

As agriculture is being taught in such a limited number of schools of this State it is not deemed advisable to suggest

more than a one-year course; this is to be given either in the third or fourth year of high school. However, as time goes by and agriculture is introduced into more of the schools and competent instructors are employed to teach this subject, it will be necessary to revise this course and in all probability make it a three- or four-year course.

There are several books on general agriculture that fit the needs of such a course particularly well. They have been in most instances prepared by men well fitted to do this kind of work and in the majority of cases they are simply compilations of the works of a large number of experts. The following are probably the best suited for this kind of a course: Warren: Elements of Agriculture; Ferguson and Lewis: Elementary Principles of Agriculture; Burkett, Stevens and Hill: Agriculture for Beginners; and Waters: The Essentials of Agriculture. The last named book, Waters: Essentials of Agriculture, published by Ginn & Company, seems more nearly to meet the needs of New Mexico schools than any of the others. It is more of a Western book.

One other feature needs comment. The laboratory exercises that are given are merely suggestive, since in the classroom special emphasis should be given to the particular crops that are of most importance in the region where the instruction is given. Frequent visits should be made to the farms in the vicinity and as many of the crops and agricultural practices as possible studied at first hand. Small plots of some crops not common in the community may well be grown on the school farm to supply illustrative material. A few chickens, a pig, or a sheep may be easily kept near the schoolhouse and the pupils taught the proper method of caring for them.

The following suggestions may be helpful to the teacher:

1. The success of the work depends laragely upon YOU.
2. Decide upon the exercise you are going to give before going to class. Work it over carefully so you can speak with authority.
3. Have each pupil provide himself with notebook and pencil with which to keep a record of the work he does. This record should include: Date, object of experiment, directions, and results. See that the record is neatly kept.
4. Keep a similar record for yourself.

5. Choose only such exercises as you think are adapted to your community.

6. Do not be afraid to interest parents in the questions that will arise from time to time.

7. With the help of the students devise exercises that appeal to them.

(Note.—The Faculty of the New Mexico College of Agriculture and Mechanic Arts, State College, New Mexico, will be glad to answer any questions and offer suggestions to any instructor who may be interested in introducing agriculture into the public schools of the State.)

SUGGESTED ONE-YEAR COURSE.

A. CROPS.

EXERCISE 1.

TO SHOW HOW PLANTS TAKE UP FOOD MATERIAL FROM THE SOIL.

Equipment: Small glass tube or funnel with a long stem; a piece of bladder or parchment paper; some sugar or molasses; a glass can, or wide-mouthed bottle.

Method: Soak the bladder or parchment in water until soft, stretch the membrane over the end of the funnel and hold it securely by wrapping with waxed thread. Now fill the funnel with a strong sugar solution or with molasses, until the liquid stands about one inch in the stem. Partly fill the jar with water and insert the funnel until the water on the outside is at the same level as the molasses or sugar solution on the inside of the funnel. In a short time the solution will be seen to rise above the level of the water in the jar and after a time overflow at the top of the stem if the funnel is not too long.

Discussion: This increase in the volume of molasses or sugar solution is due to the entrance of water through the bladder or parchment membrane. There is a slow movement in the opposite direction, but, since the water moves through the membrane much more rapidly than the molasses or sugar, there is a rapid increase in the volume of the liquid on the inside of the funnel. This movement through the membrane will continue until the solution on the in-

side has the same strength or concentration as that on the outside. The exchange of liquids through membranes is called OSMOSIS. By this process the fine root hairs of the plant are able to secure a large amount of water from the moist soil. The thin wall of the root hair corresponds to the bladder or parchment membrane, the cell sap to the sugar solution, and the soil moisture to the water in the jar. The sap is more concentrated than the soil solution on the outside of the hair, hence the water in the soil moves through the cell wall just as the water in the jar moves through the membrane and into the sugar solution.

Sprout some grains of corn and wheat between layers of dark flannel and note the very fine hairs which develop just back of the growing root tip. The moisture which enters the plant through the root hairs carries in solution certain food materials which are essential for the development of the plant. The moisture passes up through the plant and much of it is evaporated from the leaves after having performed its function as a carrier of food materials from the soil through the plant to the leaf. The food materials carried by the water are left behind in the leaf, where they are combined with substances from the air to form the tissues of the plant, including roots, stems, leaves, and seeds.

EXERCISE 2.

TO SHOW THE AMOUNT OF MOISTURE RETAINED BY PLANTS.

Equipment: A pair of scales and a drying oven.

Method: Dig up enough clover or corn plants from the field to weigh about five pounds (a single plant may be sufficient). Weigh carefully and record the weight. Place the material in a shallow tray or pan, set the pan in bright sunlight until the contents are thoroughly dry and again weigh. Subtract this weight from the original weight and calculate the per cent of moisture lost.

How many pounds of green clover are necessary to make a ton of cured hay? How much dry corn fodder in a ton of green corn plants?

Place the dried plants in a drying oven and see if more water can be driven off.

KIND OF PLANT	GREEN WEIGHT	SUN-DRIED	OVEN-DRIED	PER CENT OF MOISTURE IN THE GREEN PLANTS

Discussion: We have already found that a large part of the water taken up by the roots is evaporated from the leaves of the plant, leaving behind the food material which it carried in solution from the soil. We now see that a sufficient amount of water is retained to make up a large percentage of the total green weight of the plant. When the loss by evaporation from the leaf surface is more rapid than the water can be supplied from the soil, the plant soon wilts and ceases to grow. It has been found that our ordinary plants take up from 300 to 500 pounds of water for every pound of dry matter produced by them.

From an experiment in New York State it was found that a field of oats used 522 pounds of water for each pound of dry matter produced; corn 234 pounds; and potatoes 423 pounds.

The evaporation of the water from the surface of the leaf is known as transpiration.

In addition to the large amount of water which leaves the soil through the plant, there is a constant loss of water by direct evaporation from the surface of the soil.

EXERCISE 3.

TO SHOW THE PROPER DEPTH FOR PLANTING.

Equipment: A case consisting of two panes of glass placed about one-half inch apart and held in position by means of a wooden frame.

Method: Put an inch or two of soil in the bottom of the glass case and then place a kernel of corn on top of the soil close up to the glass. At the other end of the case a bean may be planted in the same manner. Now put in an inch of soil and again plant a kernel of corn and a bean, contin-

uing the operation until the case is full of soil to within an inch of the top. Water the soil thoroughly, cover the glass sides with black cloth or paper to exclude the light and set the case aside until the seeds have germinated. Other seeds than corn and beans may be included in the exercise.

Discussion: Seeds which are small and fine must not be deeply covered with earth, for, if they are, the weak germ which they contain will not be strong enough to reach the light and air. Large seeds, however, which contain a considerable quantity of stored material, as in the case of peas and beans, may be planted quite deeply. In fact, peas, which do not force the seed leaves out of the ground, should for the best results be planted from three to five inches in depth, while beans, which have a different method of germination, forcing their seed leaves out of the ground, should not be planted too deeply, for, as in the case of soils which are clayey and compact in nature, there will not be sufficient power in the growing stem of the bean to force the seed leaf from the soil and out into the light. The depth of planting, therefore, must be regulated by the habit of growth of the plant.

EXERCISE 4.

TO TEST THE VITALITY OF SEED CORN.

Equipment: Fifty ears of corn; a germination box; sand or sawdust sufficient to fill the box; a piece of muslin 10x20 inches.

Method: Number the ears and place them in consecutive order on a table or a bench where they will remain undisturbed until the close of the exercise. The germination box may be constructed at the school or home of one of the pupils. It consists of a shallow wooden box 3x10x20 inches inside measurement. Along all four sides of the box are saw cuts one inch deep and two inches apart. The germinator is prepared by filling the box to within one inch of the top with moist sand. The surface, having been leveled and compacted by means of a smooth block of wood, is marked off into small squares 2x2 inches, by means of a cord which is laced back and forth through the saw cuts in the edge of the box. Beginning in the upper left-hand corner, the squares are numbered from one to fifty.

Commencing with ear No. 1, remove six kernels, two near the butt on opposite sides, two near the middle and two

near the top. Place the six kernels in regular order, germ side up, in the germinator in Square No. 1 and proced with Ear No. 2 in the same manner, placing the kernels from it in Square No. 2. Repeat this process until all of the ears have been sampled.

After the grains are all in place cover the surface of the sand with a square of muslin and add sand until the box is level full. Moisten the sand thoroughly and keep it wet throughout the exercise.

The germinator should be kept at a temperature of 70° to 80° F. during the day, but at night it may fall to 50° or 60° without harm. At the end of five or six days the cloth should be carefully rolled back in order to expose the squares for inspection. Count the grains that have germinated in each square and record the numbers in the following diagram.

1	2	3	4	5	6	7	8	9	10

After careful examination, discard the ears whose numbers correspond to the square in which the grains did not grow or where germination was weak and unsatisfactory.

Discussion: It matters not how much food is available to the plants, how well prepared the seed bed, or how great the amount of moisture conserved, the best results cannot be obtained unless good seed is planted. Heretofore, much more rapid advancement has been made toward cultural methods than toward the securing of good seed. Many have never stopped to consider what constitutes good seed. In good seed there must be present in the germ that which we call life, or, as we commonly say, the seed must have vitality. Very few do more than look at an ear to determine its vitality. This is a great mistake and frequently results in a poor stand and a low yield. Without a perfect stand, the largest possible yield cannot be expected. If time is taken to count the stalks in one hundred consecutive hills, the

average corn grower will doubtless be surprised to find far from a perfect stand. He will probably find not more than 75 per cent or 80 per cent of the stalks that should be there. With such a stand and an allowance of from 5 per cent to 10 per cent for barren stalks, some explanation can be made for the low yield. There are on the average ear about 900 kernels suitable for seed. If out of every hundred ears planted four or five lack vitality, it will mean at least 2,000 fewer stalks in the field per 100 seed ears planted.

EXERCISE 5.

SMUT IN SMALL GRAINS. FORMALIN TREATMENT.

Equipment: A small amount of smutted wheat, oats, or barley; small amount of formaldehyde and plenty of clean water, together with a barrel or tub.

Method: Mix one pint of formaldehyde with 40 gallons of water (or a proportionate amount of each) in a barrel or tub. The seed may be dipped into the solution in a basket or sack, or the solution may be sprinkled upon the seed. The essential point is that all the kernels are thoroughly wet. Dry the seed as soon as possible after treatment.

Discussion: The formalin treatment of seed to prevent smut is simple, cheap, and effective. It will prevent (1) stinking smut or closed smut of wheat, (2) loose smut of oats, (3) covered smut of oats, (4) covered smut of barley. Farmers should treat their seed wheat, seed oats, and seed barley every year. The cost of treating sufficient is small and the loss due to smutted grain is very large.

Note.—In using the formalin treatment for oat smut, it is advisable to have the temperature of the water above 50° F., some authorities stating that is the water is colder than this the treatment will not be effective in this grain for smut.

B. SOILS.

EXERCISE 6.

TAKING SOIL SAMPLES IN THE FIELD.

Equipment: One soil auger, six feet long, with an extra three-foot extension; one yard of oilcloth.

Method: Select a place in the field that is representative of that particular area. Clean with care all trash and organic matter from the surface. Insert the soil auger by

turning to a depth of four inches and just before lifting give a slight upward turn to sever the connection below. Hold over a piece of oilcloth while removing the soil. Reinsert the auger and repeat the operation until a depth of one foot is reached. If a sample is desired the soil from the entire hole should be mixed on the oilcloth and an aliquot or the entire sample placed in an airtight container. The operation may be repeated for the second, third, fourth foot, if desired.

Discussion: Compare the difference between the surface soil and the subsoil. How do they differ? Describe each carefully. Notice especially the difference in color, texture, and content of organic matter of the different one-foot sections.

Study the work of the various soil-forming agencies which you find and discuss clearly and fully the part which each of these different actions plays in the formation of soils.

EXERCISE 7.

DETERMINATION OF CAPILLARY MOISTURE IN FIELD SAMPLES.

Equipment: One soil auger, six feet long; one piece of oilcloth; soil cans according to the number of students (6 for each student); one balance, sensitive to 1-10 gram.

Method: Take samples of soils that have undergone treatments in the same manner as described in the previous exercises. One-foot sections down to the desired depth should be taken. Place these samples in previously weighed, air-tight soil cans and immediately remove to the laboratory. Weigh the samples on torsion balances. Remove the lid and allow to dry at room temperature until they cease to lose weight. Determine the loss of capillary moisture from each foot.

Calculate the capillary moisture in per cent of air dry weight, per cent of wet weight, pounds per cubic foot, and surface inches.

EXERCISE 8.

SOIL TEXTURE STUDIES.

Equipment: Samples of sandy loam, sand, silt loam, clay loam, adobe clay, loess; evaporating dishes of containers according to the number of students; hand lens; test tubes and racks according to the number of students.

Method: Learn the feel of the following soils when dry and when wet to a dough: sandy loam, sand, silt loam, clay loam, adobe clay, loess.

Take six small dishes and place in each about ten grams each of the soils above mentioned. Become perfectly familiar with the feel of each of these by going from one to the other several times.

Make a hollow in the soil and add a few drops of water, enough to make a portion of it into a stiff dough after it has stood a couple of minutes. Take a portion of each of the moist soils and rub between the thumb and fingers. By aid of the feel and color when wet and dry, learn to distinguish the various types.

Spread small samples of each of the dry soils on a glass plate and examine carefully with a hand lens. Note what types are composed of soil grains well coated with humus. What are some of the minerals that you recognize? What minerals predominate in the various soils? In what types is there a tendency on the part of the soil particles to group together?

Obtain as many test tubes as there are samples of soils and place into each tube approximately one gram of one kind of soil. To the samples thus obtained, add water until the test tubes are half full. Shake thoroughly and allow to settle. Note the varying rapidity of the different soils to settle and from your observation conclude which types of soil contain the larger particles in predominating amounts.

EXERCISE 9.

CAPILLARY MOVEMENT OF WATER IN SOILS.

Note:—To be performed by the entire class or as a demonstration by instructor.

Equipment: Six glass tubes, 6 feet long and ½ inch diameter; one nest of sieves, 20, 40, 60, 80, 100 mesh; different soil types; funnel stand or ring stands for holding tubes upright; cheesecloth for tying over ends of tubes; shallow pans to hold water.

Method: The following soil types will be used in this experiment: coarse sand, fine sand, fine sandy loam, silt loam, clay loam, clay. Fill one glass tube with each of the above soil types. The tubes should be about 6 feet long and one-half inch diameter. The tubes should all be compacted the same so as to make the results comparable. With the ex-

ception of the coarse and fine sand, they should all be sifted through a 60-mesh sieve. The coarse sand should be what is caught on a 40-mesh and the fine sand that which passes through an 80-mesh.

Place the tubes in water and observe the height to which the water has risen at the end of 15 minutes, 30 minutes, 1 hour, 2 hours, 3 hours, 6 hours, 24 hours, 2 days, 3 days, 4 days, 5 days, 6 days, 7 days, 2 weeks.

Record the data in tabular form and plot curves, using time as abscissa and height as ordinates.

C. POULTRY.

EXERCISE 10.

STUDY OF AN EGG.

Equipment: For this work, a few saucers, a collection of the different sorts of eggs to be investigated, and an ordinary reading glass constitute the necessities.

Objects: To observe the differences in the contents of fresh and stale eggs and fertile and infertile eggs before and after incubation. To observe the different parts of an egg.

Procedure: Examine each egg, by candling, to observe the appearance before breaking the shell. Note the air cell of each egg. Carefully break each egg into a separate saucer. Note appearance of each class of egg. In a strictly fresh egg, find the cuticle, shell, outer and inner membrane, liquid albumin, dense albumin, chalaza, viteline membrane, dark yolk, white yolk, and blastoderm. In an egg that has been under incubation for twenty-four hours find the area pellucida, area opaca, and the primitive streak. A hard-boiled egg should also be examined, as in it some parts are more easily distinguished than in a raw egg.

D. DAIRYING.

EXERCISE 11.

MILK TESTING.

Equipment: A four-bottle Babcock test outfit: 1 four-bottle tester; six whole milk test bottles (6 in. 8%); six cream test bottles (18 gm., 6 in. 30%); six skim milk test bottles; three milk testing pipettes (17.6 c. c.); three milk testing pipettes (18 c. c.); two acid measures (17.5 c. c.); one small Quevenne lactometer; two dairy thermometers; three test bottle brushes; ample supply of Commercial Sulphuric Acid, Sp. Gr. 1.82; one copy of "Milk and Cream Testing" (with outfit). Estimated cost, $12.00.

Purpose: To determine the per cent of butterfat in whole milk, cream, and skim milk, also many other dairy products.

We would suggest that the instructor in charge of this work follow the work as outlined in the copy of "Milk and Cream Testing." It would be well to have the students experiment with milk and cream in order to determine the keeping qualities as governed by temperature and cleanliness.

Discussion: Since most of the milk and milk products are marketed on a fat percentage basis, it is most important that the student acquire and remember some of the important features of the test whereby the per cent of fat is determined. The test that is used universally in making fat percentage determinations was worked out by Dr. Babcock, and though simple and easy to operate, it is very accurate and reliable if properly handled. The principle upon which the Babcock test is based is that of centrifugal force; the fat being lighter, rises in the neck of the test bottle, which is graduated, making it possible to read the per cent of fat in the bottle, direct, thereby simplifying the operation.

Students should realize the importance of the Babcock test and its relation to modern methods of dairying. The Babcock test and the milk scales are the only satisfactory means of determining the relative value of any herd of dairy cows. If the number of pounds of milk a cow gives in one year and the average per cent of fat it contained are known, the pounds of butter-fat may be determined by simple multiplication. Knowing the pounds of butter-fat produced in one year, it is well to divide the amount by 82.5 (per cent of fat in butter) and thereby obtain the pounds of butter the animal produced during the year. The value of the finished product at 30 cents per pound, less the cost of feed and management, should show a profit; but this is not always true. The cow may be a poor producer and not even pay for her keep, and this fact can be determined accurately only by weighing the milk and applying the Babcock test.

E. HORTICULTURE.

EXERCISE 12.

PLANT PROGAGATION.

Equipment: Pruning knife; budding knife; grafting knife; bundle of raffia; wrapping twine; grafting wax; some seedling apples and peaches, one year old; and a few of the common garden or field seed.

Method: Plant the different seeds in tomato cans which have had the bottoms punctured in many places with a small nail or some similar object. These perforations are for the purpose of allowing drainage.

Cuttings: Some time during the early spring secure some small branches, preferably of cottonwood or willow, about the size of a pencil. Cut into lengths of from four to six inches. Tie in small bundles and bury in a moist, cool place about a foot deep. Lay some of the cuttings horizontally, place some top end down, and some in the position in which they grew, that is, tops up. On taking the cuttings up in the late spring (when buds begin to open on plants from which cuttings were taken) notice that the inverted cuttings will generally have more root, especially if they are covered only two to four inches and kept moist. These are called hard-wood cuttings.

Take the top of a geranium, three or four inches long, or the tip of a sweet potato that has been started in a bottle, and stick the lower end in moist soil one or two inches deep. Remove all the leaves except two or three at the tip of the plant. Keep soil moist. These are soft-wood or herbaceous cuttings.

Discussion: The white substance at the end of the hard-wood cuttings when taken out of the ground is called the callus. It is formed by a readjustment of cells and it not a growth. It is for the purpose of sealing the ends of the cutting to prevent the loss of moisture. The roots formed on the inverted cuttings better because they receive more heat. Plants require moisture, heat, and air for development.

Graftage: Grafting and Budding. Secure some branches of apple from a neighboring orchard and bury about a foot deep in a trench. This may be done at the same time the small trees are heeled-in, in fact, the small trees may be placed in one end of the trench and the branches in the other. The apple branches obtained for this purpose should

be straight, smooth, last year's growth, and about the size of a lead pencil. When treated in the above described manner, the branches and little trees will keep for four to eight weeks.

Select a branch and a tree about the same size. Cut the tree off about an inch below the ground line, or where the top of the ground came to when the tree was growing, holding the root of the tree in the hand. The part left in the hand is called the stock. The cuts should be about an inch long and straight. Cut butt end of branch to match the stock and cut it off to about six inches in length. This is the scion. Now make a cut, parallel to the grain of the wood, about one-third way from point to heel of bottom scion and stock and about five-eighths of an inch deep. Place scion and stock together so that the tongue of each fits into the slit of the other and wrap with waxed cord. Bury in moist soil about a foot deep and a union should be formed by spring.

Budding: Take some small trees or branches as soon as the sap rises or any time while sap is up. Make a T-shaped cut in the tree, just through the bark, about four inches from the ground line. Make the stem of the T first and have it about three-fourths of an inch long, then holding the knife at an angle so that it raises the bark some, make the other cut. Take a small branch in hand, so that the tip is turned toward operator, start about one-half of an inch below the bud and make a straight cut so as to come out about three-eighths of an inch above the bud. If done properly, the bud will be held between the thumb and knife blade. Open the T-shaped cut called the matrix and insert the bud, pushing it clear by placing the back of the knife blade on the leaf-stock. Tie with raffia. Budding is generally practiced on stone fruits, but is more successful on the pomaceous fruits, as the apple.

REFERENCE LIBRARY FOR AGRICULTURE.

A. **Soils.**—Whitson and Walster: Soils and Soil Fertility (Webb Publishing Co.); Hilgard: Soils (Macmillan); C. W. Burkett: Soils (Orange Judd Co.); F. H. King: Soil Management (Mrs. F. H. King, Madison, Wis.); Lyon, Fippin and Buckman: Soils (Macmillan).

B. **Manures and Fertilizers.**—Wheeler: Manures and Fertilizers (Macmillan); Hopkins: Soil Fertility and Permanent Agriculture (Ginn); Van Slyke: Fertilizers and Crops (Orange Judd Co.); Thorn: Farm Manures (Orange Judd Co.).

C. Irrigation and Dry Farming.—Widtsoe: Principles of Irrigation (Macmillan); Fortier: Use of Water in Irrigation (McGraw-Hill Co.); Widtsoe: Dry Farming (Macmillan); Campbell: Soil Culture Manual (The Campbell Soil Culture Co.).

D. Farm Management.—Card: Farm Management (Doubleday, Page & Co.); Warren: Farm Management (Macmillan); Boss: Farm Management (Lyon & Charnan); Hunt: How to Choose a Farm (Macmillan); Doane: Sheep Feeding and Farm Management (Ginn).

E. Field Crops.—Carleton: The Small Grains (Macmillan); Wilson and Warburton: Field Crops (Webb Publishing Co.); Hunt: Forage and Fibre Crops (Orange Judd Co.); Hunt: Cereals in America (Orange Judd Co.); Spillman: Farm Grasses of the United States (Orange Judd Co.); Hitchcock: A Textbook of Grasses (Macmillan); Voorhees: Forage Crops (Macmillan); Lyon and Montgomery: Examining and Grading Grains (Ginn); Dugar: Southern Field Crops (Macmillan); Piper: Forage Plants (Macmillan); Montgomery: The Corn Crops (Macmillan).

F. Animal Husbandry.—Plumb: Types and Breeds of Farm Animals (Ginn); Henry: Feeds and Feeding (Author, Madison, Wis.); Jordan: The Feeding of Farm Animals (Macmillan); Reynolds: Veterinary Studies (Macmillan); Burkett: The Farmer's Veterinarian (Orange Judd Co.); Harper: Animal Husbandry for Schools (Macmillan); Mumford: Beef Production (Author, Urbana, Ill.); Dietrich: Swine (Breeder's Gazette); Wing: Sheep Farming in America (Breeder's Gazette); Craig: Livestock Judging (Kenyon Co., Des Moines, Iowa).

G. Dairying.—Michels: Dairying (Author, Clemson College, S. C.); Eckles: Dairy Cattle and Milk Production (Macmillan); McKay and Larsen: Principles and Practices of Buttermaking (Wiley & Sons); Wing: Milk and Its Production (Macmillan).

H. Poultry.—Lewis: Productive Poultry Husbandry (Lippincott); Kaupp: Poultry Culture (Saunders Co.); Watson: Farm Poultry (Macmillan); Lewis: Poultry Laboratory Guide (Macmillan); Lewis: Poultry Keeping (Lippincott).

I. General.—Bailey: Cyclopedia of American Agriculture (Macmillan); Waters: Essentials of Agriculture (Ginn); Warren: Elements of Agriculture (Macmillan); Lipman: Bacteria in Relation to Country Life (Macmillan); Burkett, Stevens and Hill: Agriculture for Beginners (Ginn); King: Physics of Agriculture (Mrs. F. H. King, Madison, Wis.); Duggar: Plant Physiology (Macmillan).

J. Periodicals.—Breeder's Gazette, Hoard's Dairyman, Better Fruits, Wallace's Farmer, Reliable Poultry Journal, California Cultivator.

K. Bulletins.—Publications of the U. S. Department of Agriculture; Publications of the various State experiment stations.

2. Home Economics, ½-3 units.

The terms "Home Economics" and "Domestic Science" are far from satisfactory in their application to the group of courses given in the department that bears one of these names. A course in foods and cooking is, or ought to be, taught as a laboratory science. Sewing and home decoration are arts, because they are practical and because they

contribute to the development of the aesthetic sense. Marketing lies in the realm of pure economics. A more definite title for such a department would be "Domestic Art, Science, and Economics," but the length of such a title will hardly promote its ready acceptance. This bulletin uses the term "Home Economics" wherever such a combination of courses is meant, as this title is less objectionable than "Domestic Science." The latter is liable to be very misleading. For example, in a department of Domestic Science a course may be offered in sewing and textiles and the girl who takes this course offers it for entrance to some college or university as meeting the usual requirement of one unit in a laboratory science. She is misled by two things, by the term "Domestic Science" when the course she had was not a science at all, and by the double periods of time she spent in practice work, incorrectly supposing that such practice work was the laboratory part of a course in science. On the other hand, a course in foods and cooking can be organized and taught in such a manner that it may be acceptable to the University as a laboratory science. The Committee on Student Standing have agreed that when a course in foods and cooking shall measure up to the following standard it may be accepted as fulfilling the entrance requirement of one unit of a laboratory science: "A course in foods and cooking will be accepted as a laboratory science when the high school course includes a study of the principles and the laws of cookery applied to each principle and a qualitative study of our common foods; with notebook work so written that the results may be judged by the instructors of the department at the University. This is understood to mean a clear statement, in the form of a conclusion, to notes taken on each lesson. Notes on class work must also be incorporated in order that the scope and content of the course may be estimated. Not less than one unit of such work will be accepted—this to constitute an equivalent of 180 hours of practice work with two recitations per week."

When such a course is offered and accepted as a laboratory science, other courses in Home Economics will be accepted as elective offerings towards entrance up to three units.

CONTENT AND AIM OF COURSES IN HOME ECONOMICS.

(Furnished by Associate Professor Frances Lathrop.)

High school courses in Home Economics should have two definite and clear aims: (1) To give the prospective teacher an intelligent understanding of the fundamental principles of home making; (2) To give the student (a) an interest in the subject, (b) a fund of knowledge, (c) understanding of child nature, (d) concrete teaching, (e) an understanding of how the work may be correlated with other subjects, (f) interest in the art of home making.

The outline suggested below is purely suggestive and may be enlarged or cut down to suit the facilities of the individual school.[4] The book, "Equipment for Teaching Domestic Science," by Helen Kinne of Columbia University will prove to be of great assistance to anyone interested in installing the equipment of this department. It may be obtained from Whitcomb & Barrows, Boston, Mass.

Home Economics properly begins in the Fourth Grade. Girls in this grade should be able to make towels, using baste, running stitch, turned hems, blanket stitch, chain stitch, and learn to run hems.

Fifth Grade: Underlying idea—helpfulness in the home. Care should be given to the acquisition of neatness and accuracy in all work, and to the corect position of body, tools, and work. Care of material, clothing, and tools. Sixty minutes a week given to this work.

Sixth Grade:

(A) Sewing. Economy in work is the important phase in this grade. Knowledge of machinery in the home. Use of sewing machine. Make cooking apron. Practice on straight seams. Sixty minutes per week.

(B) Cooking. Study of equipment. Use of each article. Dish washing. Study of simple fruits, as apples, and of vegetables, as potatoes, and of simple cereals, as rice, oatmeal, cream of wheat. The cooking of starchy foods. Ninety minutes per week.

Seventh Grade:

Ninety-minute periods three times per week are advised.

(A) Sewing. Review of stitches, making of napkins, use of napier hem, making of buttonholes, patching, making felled and French seams.

(B) Cooking. Albumen and its sources. Effects of heat and cold upon it. Cooking of eggs and meats. Soups made from meats. Use of eggs and milk combined—custards. Making of quick breads and batters.

Eighth Grade:

Ninety-minute periods three times a week are advised.

(A) Sewing. 1. Making of tailored shirtwaist.
(a) Study of samples of goods.
(b) Drafting a pattern.
(c) Designing the waist.
2. Study of woolen materials, prices ,etc.
3. Drafting pattern for woolen skirt, cutting pattern, fitting, and making skirt.
4. Repairing by patching and darning.
5. Study of the cost of clothes.
6. House furnishings and cost.

(B) Cooking. The making of doughs, baking powder biscuits, simple cakes, bread (first lessons), simple salads, and the cooking of vegetables.

HOME ECONOMICS COURSE IN HIGH SCHOOL.

It is suggested that the curriculum include:

Ninth Grade, first semester:

Biology, ½ unit: Hand Sewing, ½ unit.

Second semester:

Free Hand Drawing or Science, at least ½ unit. Foods and Cookery, ½ unit.

Tenth Grade, first semester:

Foods and Cookery, ½ unit.

Second semester:

Physiology, ½ unit: Personal Hygiene and Home Nursing, ½ unit.

Eleventh Grade, first semester:

Physics, ½ unit: Dressmaking, ½ unit.

Second semester:

Physics, ½ unit: The House, ½ unit.

Twelfth Grade, first semester:

Chemistry, ½ unit: Care and Selection of Clothing, ½ unit.

Second semester:

Chemistry, ½ unit: Elementary Dietetics and Serving of Meals, ½ unit.

Note.—Where it is desired to offer three years' work in Home Economics, it is suggested that the work be about equally divided among Sewing and Textiles, Foods and Cooking, and Home Making. Suggestive courses in each are given below.

Sewing.

This course includes: Preparation for work, position at desk or table, utensils and their use. Study of cotton and wool, warp and woof. Darning, basting, running stitch, back stitch, over-casting, hem, eyelets, mitred corner. This problem is illustrated by making a work bag. French hem, French fell seams, French seams, hemming stitch, hem stitching, muslin ruffle, gathering buttonholes. Problem II, Corset Cover. Take measure, test pattern, draft one, cut, and make. Problem III, Towel, feather stitch, blanket stitch, chain stitch. And so forth.

Foods and Cooking.

Such a course would naturally include:

1. Study of equipment and tools.
2. Cleaning agents.
3. Starches—potato, corn, cereals, effect of moist and dry heat.
4. Baking powder and leavening agents.
5. Doughs, drop and pour batters, baking powder biscuits.
6. Yeasts.
7. Flours and bread making, rolls, Dutch apple cake.
8. Eggs and protein food. Tests for freshness, preservation, effect of heat, digestion of eggs, value as a food, cooking of eggs, as scrambled, poached, omelet.
9. Milk. Composition, value as a food, care of, etc.
10. Eggs and milk combined. Custards and puddings.
11. Cheese. Kinds, Welsh rarebit, cheese fondue, etc.
12. Meat. Composition, digestibility, value as a food, effect of heat, different forms of cooking meat, pan-broiled steak, meat loaf with tomato sauce, Hamburg steak, beef stews, cuts of beef (a) tender and expensive, (b) cheaper and tough. Cooking of veal, mutton, and pork.
13. Vegetables. Classes, value as food, suitability with meats, cooking of creamed carrots, creamed onions, spinach —value as food, scalloped tomatoes, soups, scalloped rice.
14. The Lunch Box. Equipment, planning, packing.

15. Cakes. Sponge and butter cakes and their difference.

School and Home.

Such a course would naturally include:

1. Care of health. Sanitary conditions in home and school, ventilation, lighting, heating, drinking water—its source, composition, value in diet.

2. Home and school furnishing. Draperies, wall coverings, furniture, pictures.

3. Physical efficiency. Food—Kind, preparation, habits of eating. Clothing—Choice, style, care of. Care of body—Postures, care of skin, hair, teeth.

EQUIPMENT FOR HOME ECONOMICS.

1. Individual Equipment.

Multiply this by number of pupils that may be accommodated in one section of the class.

Desks with bread and cake boards.

1	Gas or other burner.	1	Kitchen knife.
1	Rolling pin, size 7½ inch.	1	Kitchen fork.
1	3″ by 5″ bread pan.	1	Wooden spoon.
1	Custard cup, white lined.	1	Egg whisk.
1	Granite mixing bowl.	1	Wire sieve.
1	6″ granite utensil plate.	1	Steel skillet (small).
1	Paring knife.	1	Sauce pan with cover (aluminum).
1	Tablespoon.	1	Glass measuring cup.
2	Teaspoons.	1	Tin measuring cup.

II. Class Equipment.

1	Refrigerator.	12	Cups and saucers.
1	Tea kettle.	12	Plates
1	Food chopper.	1	Granite coffee pot or percolator.
1	Granite kettle, 3 qts.	1	Granite tea pot.
1	Large steel skillet.	1	Nutmeg grater.
2	Granite sauce pans with covers.	1	Double boiler (pt.).
2	Granite mixing bowls, 2 qt. size.	1	Double boiler (qt.).
1	Can opener.	5	Dish pans.
1	Covered garbage can.	5	Rinsing pans.
4	Muffin pans 9 holes).	1	Lemon squeezer.
4	Square cake tins.	1	Potato masher.
1	Round cake tin.	1	Chopping bowl and knife.

1 Good range, coal, wood, gas, or electric.

TEXT AND REFERENCE BOOKS.

Cooley: Domestic Art in Woman's Education (Whitcomb & Barrows, Boston); Kinne and Cooley: Shelter and Clothing (Whitcomb and Barrows, Boston); Woolman: Sewing Course for Schools, Text (Whitcomb & Barrows, Boston); University of Illinois Bulletin 24, Feb. '14: Syllabus of Domestic Science and Art for the High School (University of Illinois,

Urbana, Ill.); Bevier: The House; Its Plans, Decorations and Care (Am. School of Home Economics, Chicago); Terrill: Household Management (Am. School of Home Economics, Chicago); Johnson: Domestic Science for Schools and Homes (Burton Pub. Co., Kansas City); Patton: Home and School Sewing (Whitcomb & Barnes, Boston); Kinne: Equipment for Teaching Domestic Science (Whitcomb & Barnes); Kinne and Cooley: Food and Household Management (Whitcomb & Barnes); Chambers: Principles of Food Preparation (Boston Cooking School Pub. Co.); Parloa: Home Economics (Whitcomb & Barnes); Williams and Fisher: Elements of the Theory and Practice of Cooking (Macmillan); Farmer: The Boston Cooking School Cook Book (Little, Brown & Co.); Hill: Practical Cooking and Serving (Doubleday, Page & Co.);Farmers' Bulletins published by the U. S. Department of Agriculture, Washington, D. C. (distributed free).

3. Commercial Subjects. 1-4 units.

Electives from this group up to the maximum amount of four units may be offered by graduates of accredited high schools towards entrance to the University. But Spelling, Penmanship, and Typewriting can not be accepted as meeting any portion of the University entrance requirements. It will be noticed that any student who completes the four-year course outlined below can enter the University only conditionally. He will lack Plane Geometry and a laboratory science. However, students who take four full years in the commercial department of a high school are looking forward to an office position rather than to a college course. With a little planning and foresight it is an easy matter for any student who expects to attend the University to plan his course in such a way that he can enter the University unconditionally and at the same time complete a fairly large number of courses in commercial branches.

SUGGESTIONS FOR COMMERCIAL TRAINING IN HIGH SCHOOLS.

(Furnished by P. E. Leavenworth, sometime Instructor in Albuquerque High School.)

The primary purpose of the commercial course in high schools should be to fit the pupil for office work under the requirements of careful business men rather than to emphasize any line of mental training. The following suggestions are given from this point of view.

The most thorough and practical course is the combined bookkeeping and stenographic course, two years being offered in each of the major subjects, bookkeeping and stenography. Bookkeeping should be offered during the first

two years and stenography during the third and fourth years. Four years of English should be required, two years of mathematics (including commercial arithmetic), and two years of science. Economics or commercial geography, and commercial law should be offered during the third year. American history and civics should be given during the fourth year. Penmanship and spelling at graduation should satisfy the requirements of careful business.

Care should be taken to make the instruction in these subjects as practical as possible, avoiding undue emphasis of theory. The first year of bookkeeping should deal with the use of the journal, cash book, sales book, invoice book, and ledger; and the use of negotiable paper and business forms. The second year may be varied to suit local business conditions, placing emphasis upon wholesale accounting, corporation accounting, and banking. Commercial arithmetic should deal almost entirely with the fundamental operations, great emphasis being placed upon rapid calculation in adding, subtracting, multiplying, and in handling fractions. Commercial law should be confined to the laws governing negotiable paper and a thorough understanding of contracts. Penmanship requirements for business are legibility, facility, and rapidity—muscular or arm movement being emphasized. The subject of stenography includes both shorthand and typewriting and each requires two years as outlined in this course. The first year of shorthand should be devoted to the principles of the system with light dictation occasionally, taking up regular amanuensis and office practice work the second year. The first year of typewriting should be spent in learning the keyboard and the arrangement of various business forms on the page. More emphasis should be placed on learning the touch method than on the amount of work done. The pupil should be able to write at the rate of forty words a minute from printed matter at the end of the second year.

Schools having only two years of high school work may well divide the above outlined course, offering either bookkeeping or stenography and as much of the other commercial work as the pupil finds time for.

Schools having only one year of high school work would probably find it better not to offer stenography but may offer first year of bookkeeping, typewriting, etc.

No other equipment would be necessary for bookkeeping work than large flat top desks with bookshelf. Ordinary desks or tables might be used. For the stenography class one typewriter would be necessary for each group of four pupils; also one filing cabinet, one mimeograph or neostyle, and one letter press should be included in the equipment. This material may be obtained from any local furniture or stationery dealer except the typewriters, which are handled by the following companies, with headquarters at Denver and El Paso:

L. C. Smith & Bros. Typewriter Co.
Remington Typewriter Co.
Underwood Typewriter Co.
Royal Typewriter Co.
Fox Typewriter Co.
Oliver Typewriter Co.

TEXT OR REFERENCE BOOKS.

A. Pitman Shorthand.—Phonographic Amanuensis (Phonographic Institute, Cincinnati, O.); Phonographic Dictionary (Phonographic Institute, Cincinnati, O.); Reporter's Companion (Phonographic Institute, Cincinnati, O.); Progressive Dictation Exercises (Phonographic Institute, Cincinnati, O.); Universal Manual and Dictation Course (L. W. Musick Pub. Co., St. Louis); Dement's Dictators (Dement Pub. Co., Chicago, Ill.); Eldridge's Dictation Exercises (Am. Bk. Co., Chicago, Ill.); Brief Course in Shorthand (Barnes Pub. Co., St. Louis, Mo.).

B. Gregg Shorthand.—Gregg Manual (Gregg Pub. Co., Chicago, Ill.); Gregg Penmanship (Gregg Pub. Co., Chicago, Ill.); Gregg Speed Practice (Gregg Pub. Co., Chicago, Ill.); Gregg Dictation Practice (Gregg Pub. Co., Chicago, Ill.); Gregg Reporter (Gregg Pub. Co., Chicago, Ill.); Gregg Dictionary (Gregg Pub. Co., Chicago, Ill.); Gregg Phrase Book (Gregg Pub. Co., Chicago, Ill.); Gregg Graded Dictation (Gregg Pub. Co., Chicago, Ill.).

C. Bookkeeping.—Williams and Rogers (Am. Bk. Co., Chicago, Ill.); Sadler Rowe (Sadler Rowe Pub. Co., Baltimore, Md.); Twentieth Century (Southwestern Pub. Co., Cincinnati, O.); Moore and Minor (Ginn & Co., Chicago, Ill.); Principles of Bookkeeping and Farm Accounting (A. N. Palmer Co., Cedar Rapids, Ia.); Household Accounting (A. N. Palmer Co., Cedar Rapids, Ia.).

4. Manual Training, ½-2 units. (Furnished by Associate Professor A. K. Leupold.)

The course should consist partly of lectures and recitations, but the greater part should consist of practice work, to which two or more consecutive periods should be given. The student should early learn the use and care of various tools used by the wood-bench worker. The course should consist of exercises in laying out work in the proper man-

ner and using the tools and operations which are employed most frequently. After considerable skill in the use of tools has been acquired the work should proceed to the more complicated operations as the student progresses in skill. The student should become proficient in sawing and planing and in all the operations of the woodworker. The exercises, as far as possible, should be given to the making of practical things so as to enlist the interest of the student.

When it is practicable to add a second and third course this work should consist of woodturning and pattern making.

EQUIPMENT FOR THE FIRST COURSE IN WOOD WORK.

I. **Individual Tools (One set for each bench).**

1 Jack plane, 14″ long, 2″ bit.
1 22″ panel saw.
1 6″ try square.
1 Marking gauge.
1 Two-foot rule.
1 Mallet.
1 ⅜″ Chisel (firmer socket).
1 ¾″ Chisel (firmer socket).
1 4″ Screw driver.
1 Bench brush.

II. **General Tools (One set for classes up to 20 students).**

3 Smooth planes, 7″ or 8″, 1⅝″ bit.
2 Block planes 6″ long.
1 Jointer plane 22″ long.
1 8″ Draw knife.
4 Hand scrapers.
2 Back saws.
3 Rip saws, 6 point, 22″ long.
2 Coping saws.
1 Compass saw.
1 Complete set of firmer socket chisels (13).
3 Each ¼″, ½″, and 1″ gouges.
2 Each half round bastard files, 10″ half round cabinet files.
3 Bracket braces, 10″ swing.
6 ⅜″ Auger bits.
1 Complete set of auger bits (13) by sixteenths.
8 Gimlet bits, ⅛ to ¼″ in size.
2 Screw driver bits.
2 Screw drivers, 6″ and 8″.
1 Mortise gauge.
6 Claw hammers.
6 Nail sets.
3 Framing squares.
2 Bevel squares.
3 12″ screw drivers.

3 6″ dividers.
2 Brad awls.
2 Oil stones, 8 by 2 by 1. Carborundum or Pike India.
2 Small oilers.

III. Department tools.

6 Hand screws, 6″.
4 Steel bar clamps, 36″.
1 Saw clamp.
6 Taper files (3 cornered).
1 Saw set.
1 File card and brush.
2 Pairs pliers.
1 Set 3-16″ steel figures.
1 Set stencils, figures, and letters.

EQUIPMENT FOR COURSE IN WOOD TURNING.

For each lathe set:

A speed lathe with 12″ swing, turning 36″ between centers.
4 Skew chisels ¼″ to 1″.
4 Gouges ¼″ to 1″.
1 Parting tool.
1 Oiler.
1 Oil stone.
1 Pair outside calipers 6″.
1 Pair dividers 6″.
1 Pair inside calipers 6″.
1 Combination square 12″ with centerhead detachment.

A course earning ½ to 3-5 unit should consist of 18 weeks' work of three two-hour periods in the shop and some outside reading.

Textbook recommended: Ross: Woodturning.

HIGH SCHOOL REFERENCE LIBRARY ON MANUAL ARTS.

Ross: Woodturning (Ginn); Wheeler: Woodwork for Beginners (Putnam); Goss: Benchwork in Wood (Ginn); Griffith: Essentials in Woodworking (Manual Art Press, Peoria); King: Elements of Woodwork (Am. Bk. Co.); King: Elements of Construction (Am. Bk. Co.); King: Inside Finishing (Am. Bk. Co.); King: Handbook for Teachers (Am. Bk. Co.); Smith: Principles of Machine Work (Industrial Educ. Bk. Co., Boston); Smith: Advanced Machine Work (Industrial Educ. Bk. Co., Boston); Ilgen: Forge Work (Am. Bk. Co.).

MECHANICAL DRAWING.

A course in Mechanical Drawing should represent work both in class and at home. The course should be divided as follows: Lettering and use of instruments, orthographic projection, isometric and oblique projective, and perspective drawing. Drawing should be made from plate specifications and also from actual machine parts. For 3-5 unit, six hours' time should be spent in classroom work exclusive of

the plates to be done at home. Textbook recommended: H. W. Miller: Mechanical Drafting, and also his plate specifications.

EQUIPMENT FOR MECHANICAL DRAWING.

The school should provide drawing desks or tables and drawing boards for the class. Each student furnishes his own paper and instruments as follows:

Large compasses (ink and pencil combination).
Large dividers.
Ruling pens (one or two).
1 lettering pen.
Bow pencil, bow pen, bow dividers.
2 triangles (6″-45), (6″-30-60).
1 24″ Tee square.
Drawing ink.
Drawing pencils, 3H, 4H, 6H,
Thumb tacks, erasers, art gum, sand paper.
1 architect's scale 12″.
1 protractor.
12″ x19″ paper is recommended, the finished plates being 12″ x18″. For home plates, 8½″ x11″ paper. Crane's Jap Linen recommended.

HIGH SCHOOL REFERENCE LIBRARY ON DRAWING.

(Furnished by Professor A. W. Wand.)

Harper: Practical Handbook of Drawing; Everett and Lawrence: Freehand and Perspective Drawing; Barnes: Elementary Drawing; Crosskey: Elementary Perspective; Crosskey and Thaw: Advanced Perspective; Wilson: Freehand Perspective; Rawson: Manual of Drawing; Frederick: Simplified Mechanical Perspective; Randall: Shades and Shadows; Walker: Handbook of Drawing; Turill: Elementary Course in Perspective; Havey: Pencil Sketching; Leland: Drawing and Designing; MacCord: Mechanical Drawing; Reinhardt: The Technic of Mechanical Drawing; Miller: Mechanical Drafting.

Music, ½-2 units.

Inasmuch as Music is one of the few subjects now offered in high schools that develop the aesthetic sense, the Faculty of the University have voted to encourage its study by accepting it towards entrance to the University. Since courses in Music in high schools are not yet standardized it will be necessary for students who offer Music for entrance to stand examination in this subject in order to secure credit towards entrance. A maximum of one unit will be allowed candidates who meet the standards set below in the Theory of Music and a maximum of one unit will likewise be allowed whenever candidates meet the standard in Voice or Instrument, as described below.

1. Elements of Composition; Harmony and Structure. —One-half to one unit. Harmonic series. Intervals. Erection of the three primary triads. Root positions and doubling in major. Formation of scales. Relations of scale constituents to root and their tendencies. Consonance and dissonance. Chord connection in four parts. Harmonizing of melodies. Elements of melodic construction; cadence; phrase and double phrase. Minor mode. Secondary triads and their use. Other sevenths (within the key). Suspension and retardation. Modulation (simple). Anticipation and embellishment.

2. Instrumentation and Vocal Technique.—One-half to one unit. Ability to perform with satisfactory technique and intelligent interpretation one or more numbers in one of the following sections:

(a) Pianoforte: Bach: "Well-Tempered Clavichord," Prelude or Fugue; 2 and 3 part inventions; Mozart or Beethoven: a sonata; Chopin: study, nocturne or prelude of moderate difficulty.

(b) Violin: Bach, Handel, Mozart, Beethoven: a sonata; Rhode, Fiorillo: a study of moderate difficulty; Viotti, Spohr: a concerto.

(c) Orchestral instruments; Similar ability to perform on any orchestral instrument.

(d) Voice; Bach, Mozart, Schubert, Schumann, Brahms, Franz, Wagner: songs; or an aria by an old Italian master.

SUGGESTED LIST OF BOOKS ON MUSIC FOR HIGH SCHOOL REFERENCE LIBRARY.

(Furnished by Associate Professor E. Stanley Seder.)

Pratt: History of Music; Hamilton: Outline of the History of Music; Parry: Evolution of the Art of Music; Mason: Beethoven and His Forerunners; Mason: The Romantic Composers; Mason: From Grieg to Brahms; Mason: Orchestral Instruments and What They Do; Krehbiel: Studies in the Wagnerian Drama; Mason: Opera Stories; Pauer: Musical Form; Upton: The Standard Operas; Upton: The Standard Symphonies; Upton: The Standard Oratorios; Elson: The National Music of America and Its Sources; Mees: Choirs and Choral Music; Henderson: Richard Wagner, His Life and His Work; Huneker: Chopin, The Man and His Work; Grove: Dictionary of Music and Musicians (5 volumes); Henderson: The Orchestra and Orchestral Music.